

Slope Fun

Mike, Nate, Phil, Megan and Alison

MATH 081 – Elementary Algebra I

Instructor: Mike Nevins

Workshop Wednesday #6

Everett Community College



Mike reads the first problem:

“Describe the slope in the following table of values.”

values.

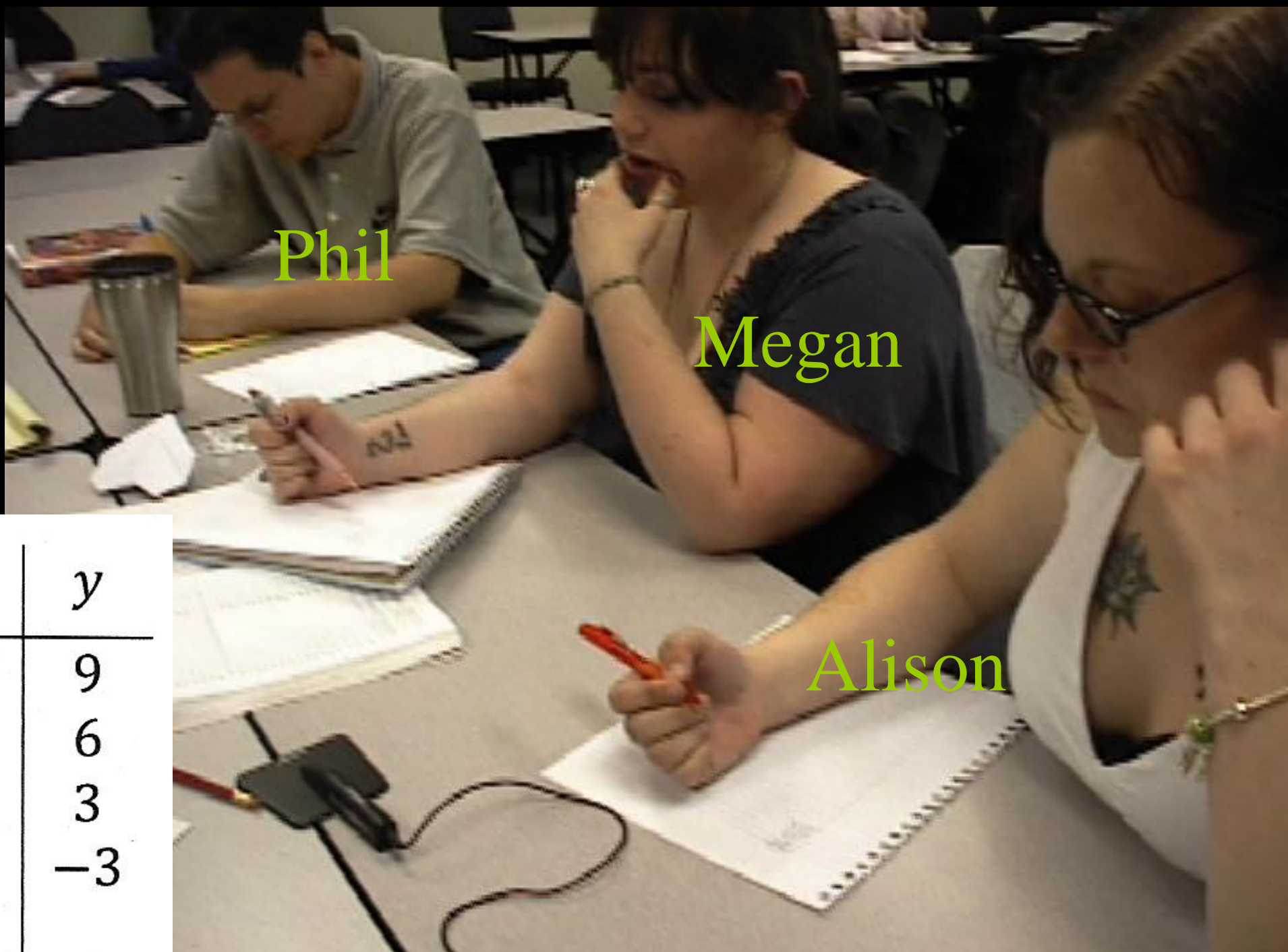
Names: Mike

| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

re stuck, it might help to find a

X is -2, -1, 0, 2

Y is 9, 6, 3, -3



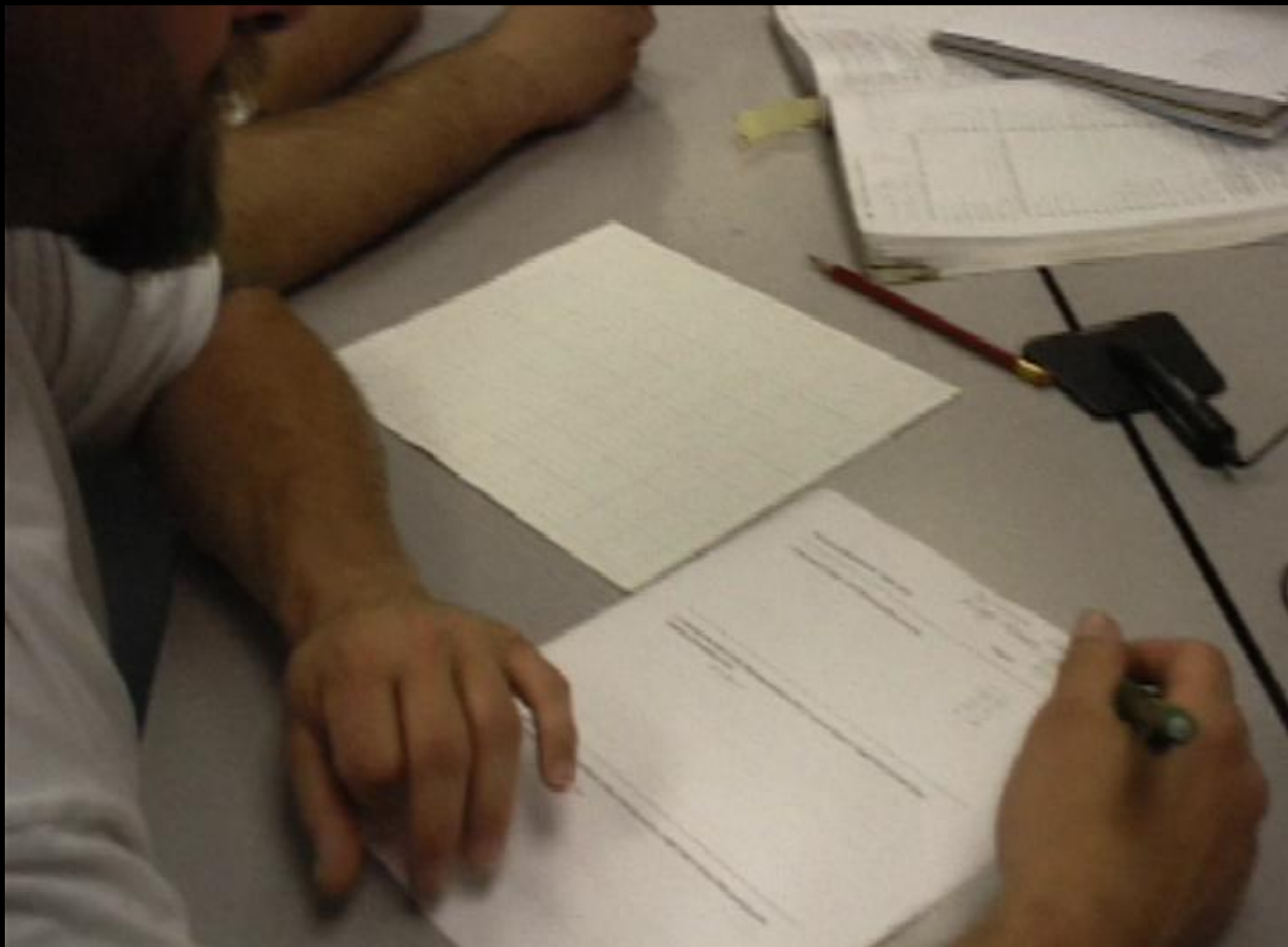
Megan: We all already see the pattern for the Y side.

Mike: It goes backwards by 3's, correct?

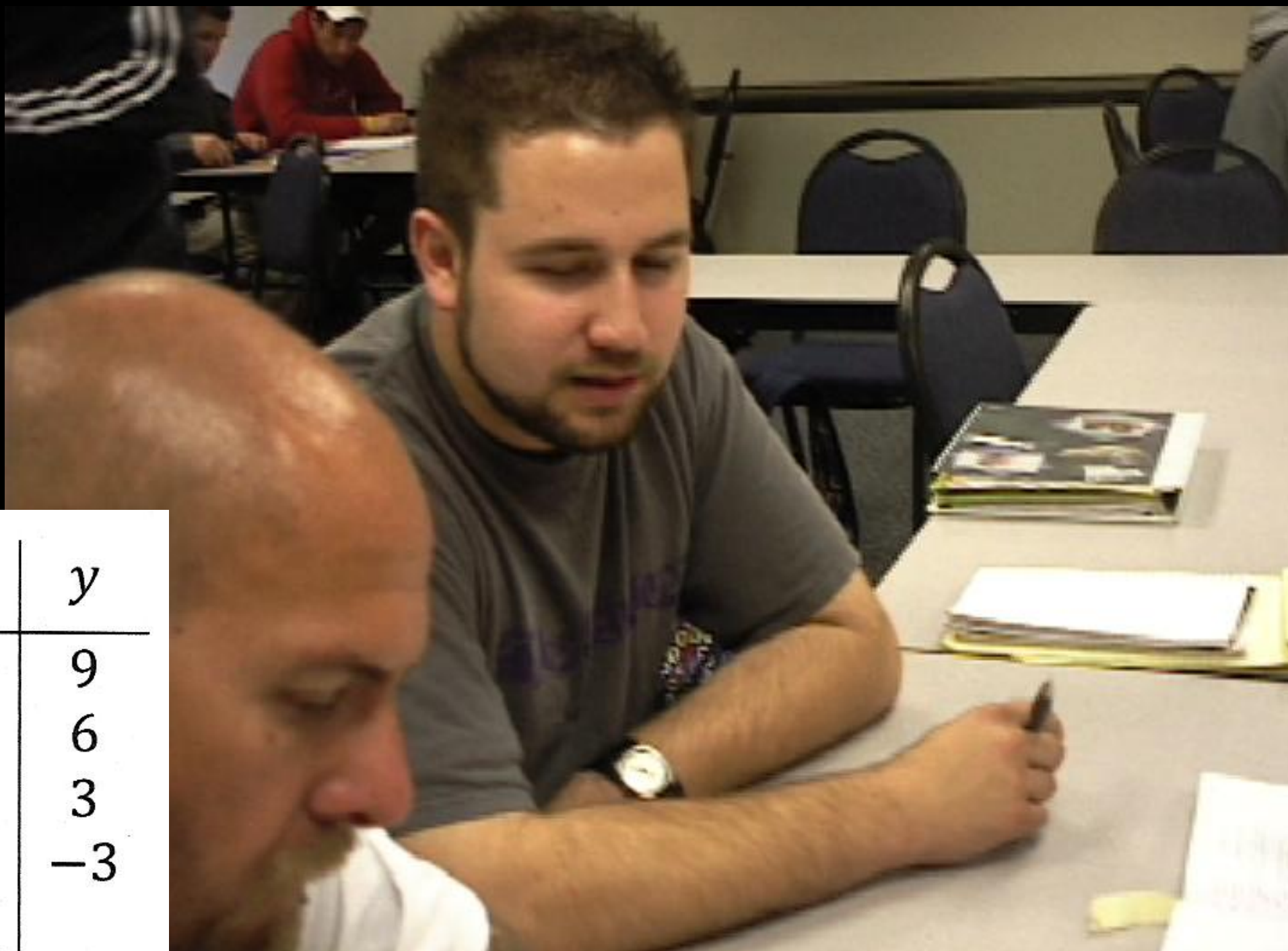


| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Megan: Until you get to 0, and then you jump to 2.
Then it goes to -3, so you are missing... *(pause)*
At 2 it should be - 6. Right?



Mike: You are right. Absolutely.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Nate: Wouldn't 1 actually be 0? That is making a six jump.

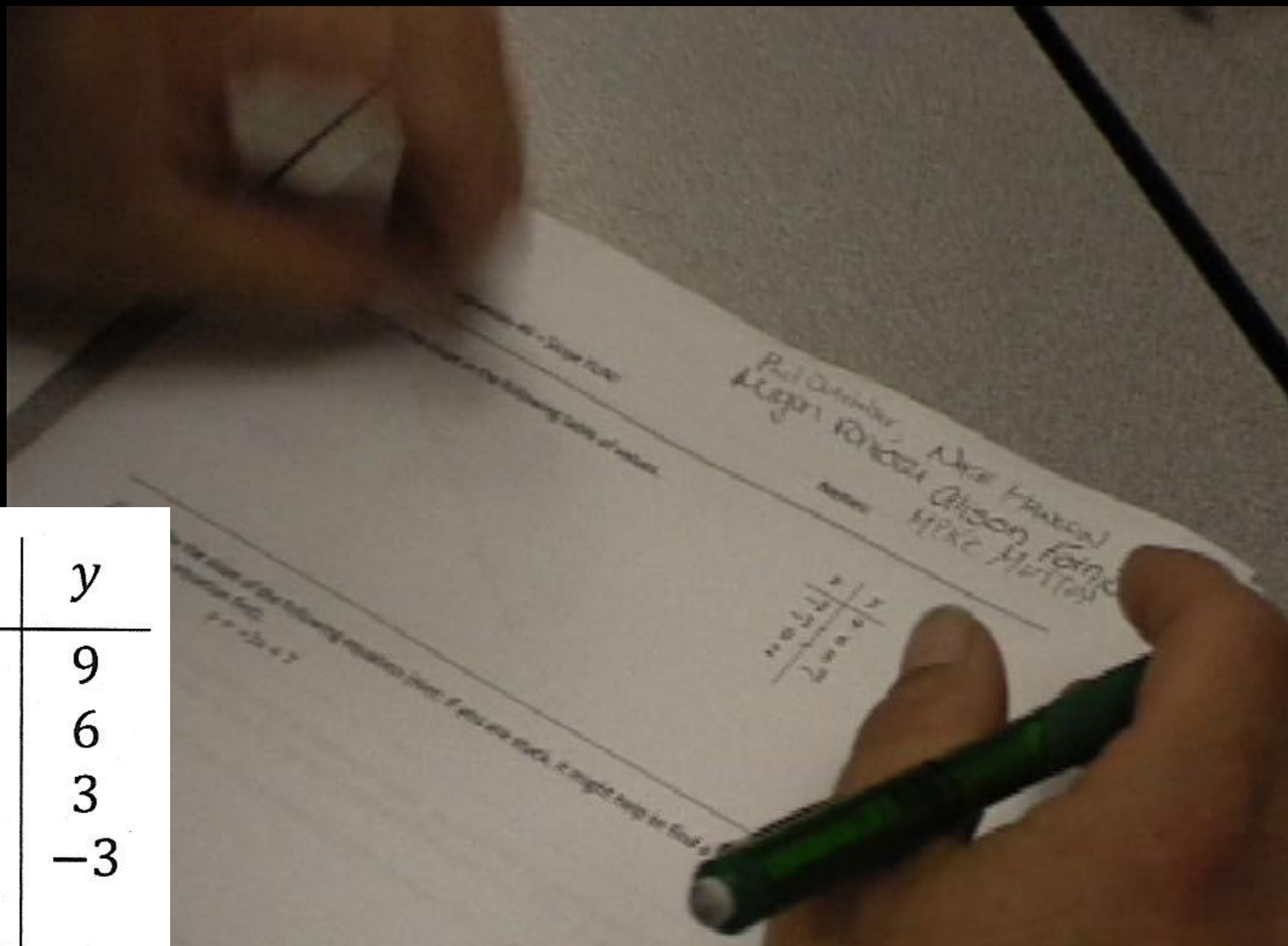
Phil: That's making a six jump, yeah.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Nate: If we had a 1 in value place, we would have 1 equals...

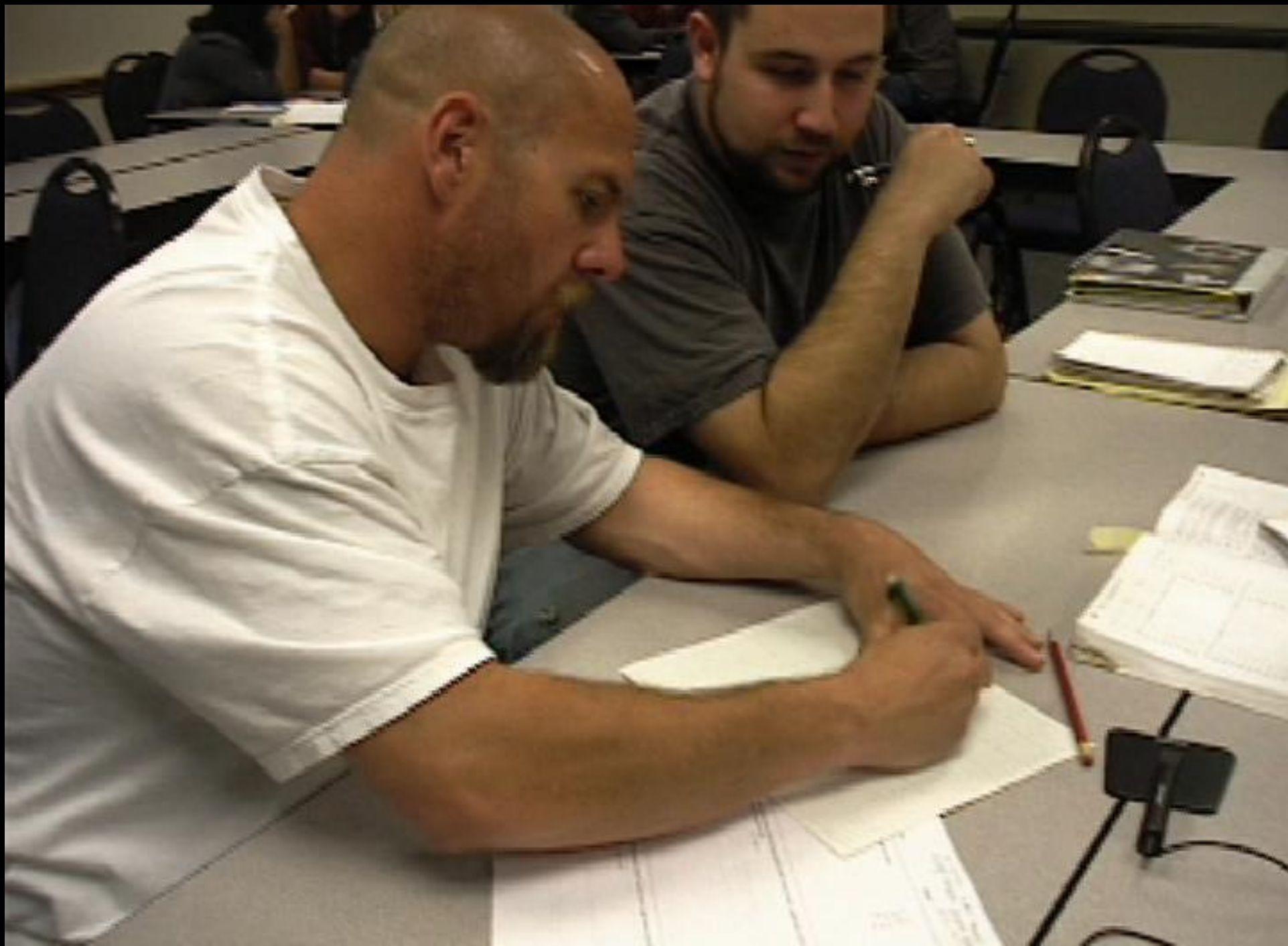
| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |



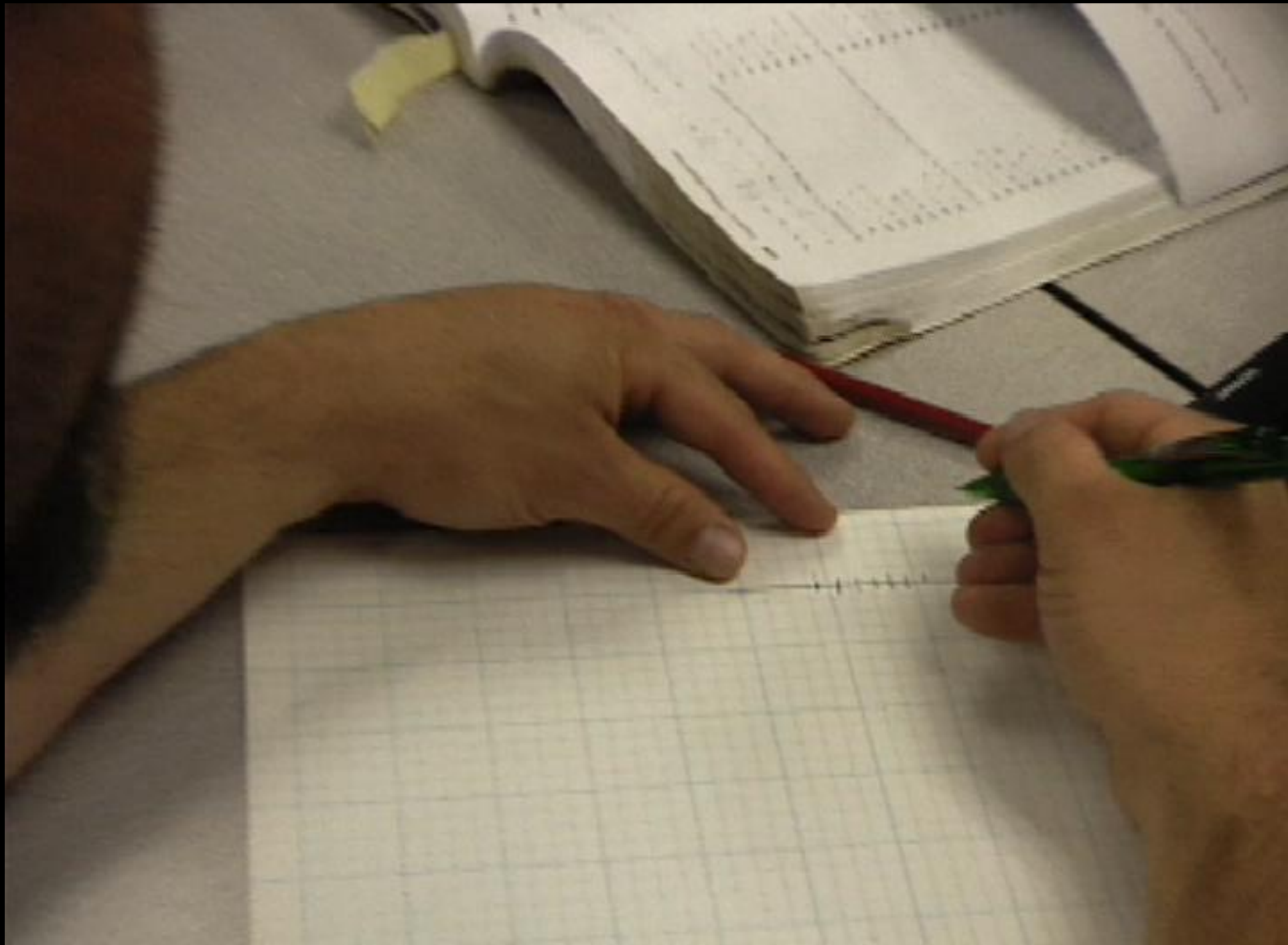
Mike: -1 to 6



Megan: So we are saying what? It is 1 to 3, right?



Mike: If you go from -1 on a number line... Here is 0.



Mike counts the hash marks: 1, 2, 3, 4, 5, 6.



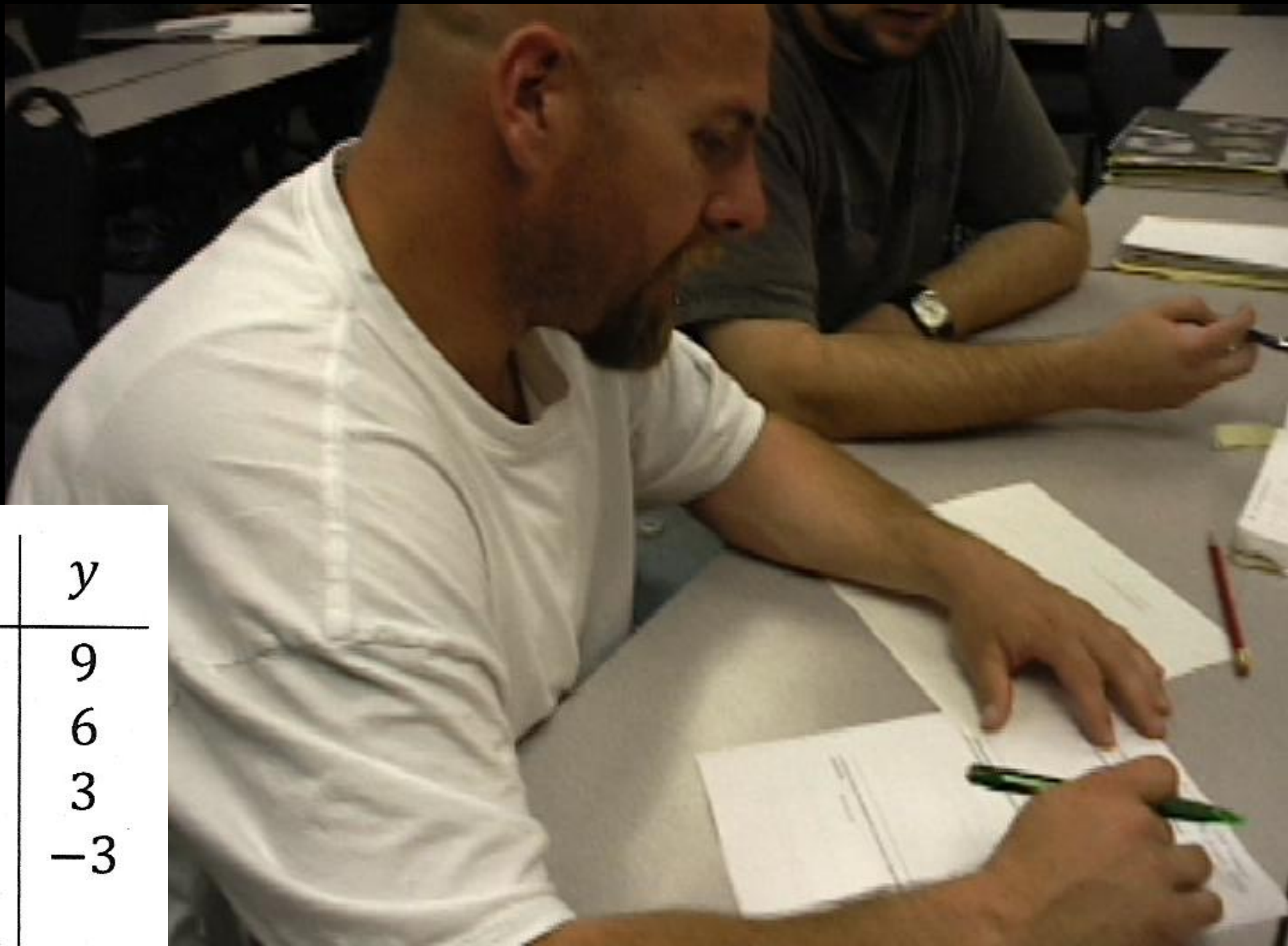
Nate: There has to be some significance of it going in the inverse in the Y axis.



Megan: It would be -3 , because it is going down, right?



Phil: Yeah. The numbers are going down.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

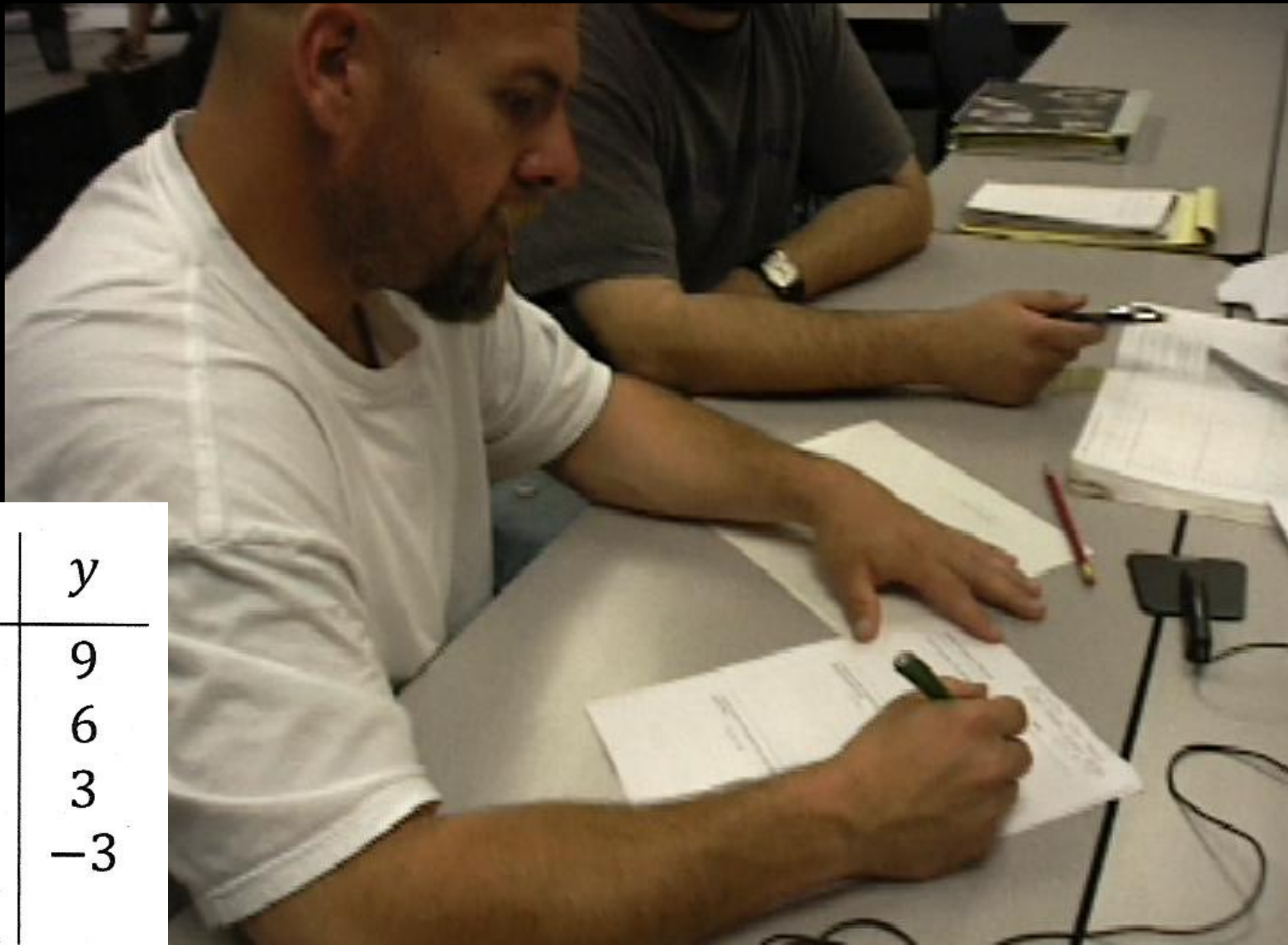
Mike: -2 to 9 is 7; -1 to 6 is 7; then 0 to 3 is 3; 2 to -3 is 5.



Mike: So there is no set pattern.
Phil: It looked like there was a pattern.



Megan: What did you say again?
Alison: I am sorry. I was filling this out.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Mike: -2 to 9 is how much?

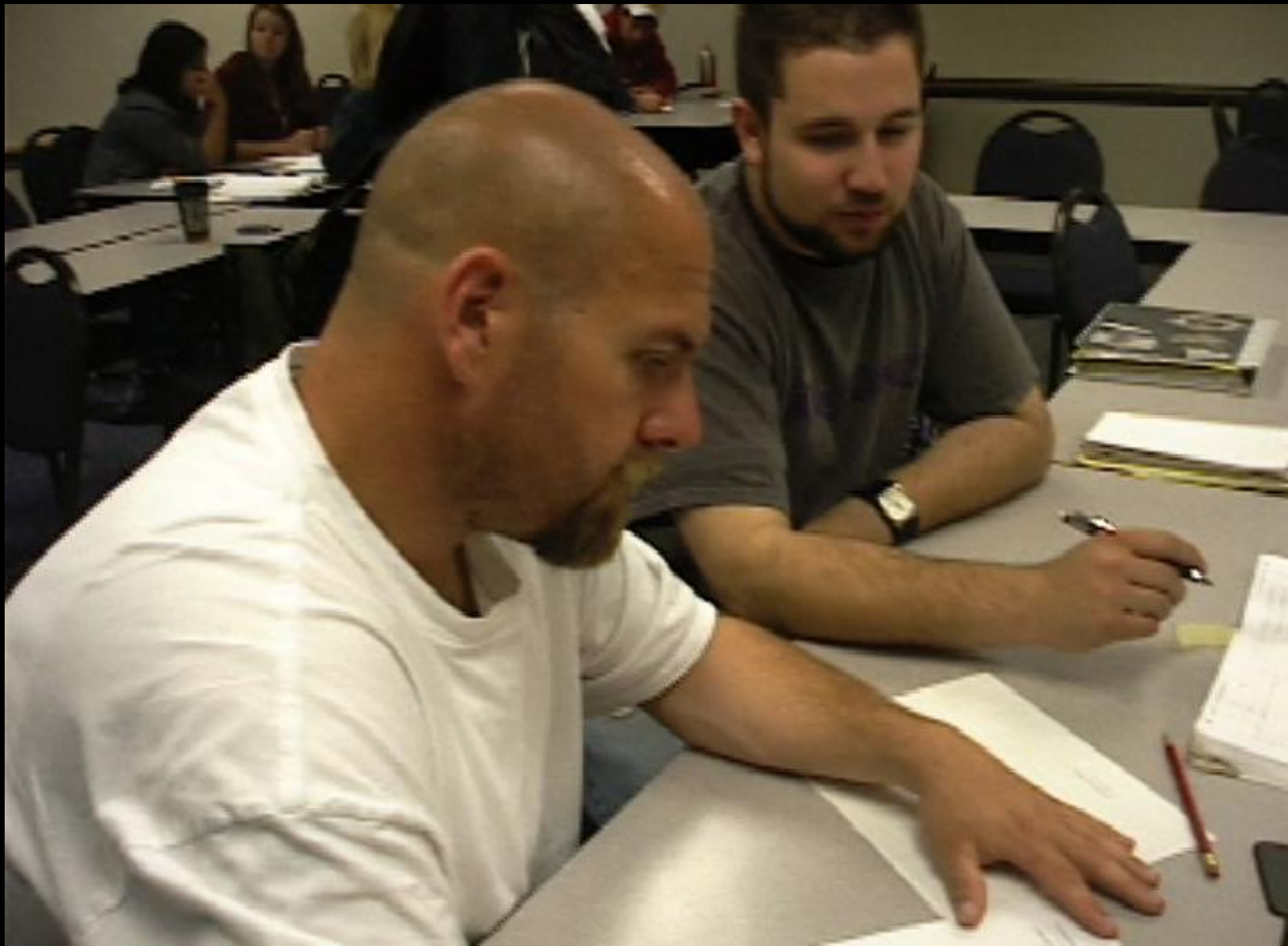
Megan: 7.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Mike: -1 to 6 is how much?

Megan: 5.



Nate: I don't think you are supposed to directly correlate your X's and Y's like that.

$$Y = 2X + 6$$

| X | Y |
|---|----|
| 0 | 6 |
| 1 | 8 |
| 2 | 10 |
| 3 | 12 |
| 4 | 14 |
| 5 | 16 |
| 6 | 18 |

Slope is a ratio that desc

the change in x's to the

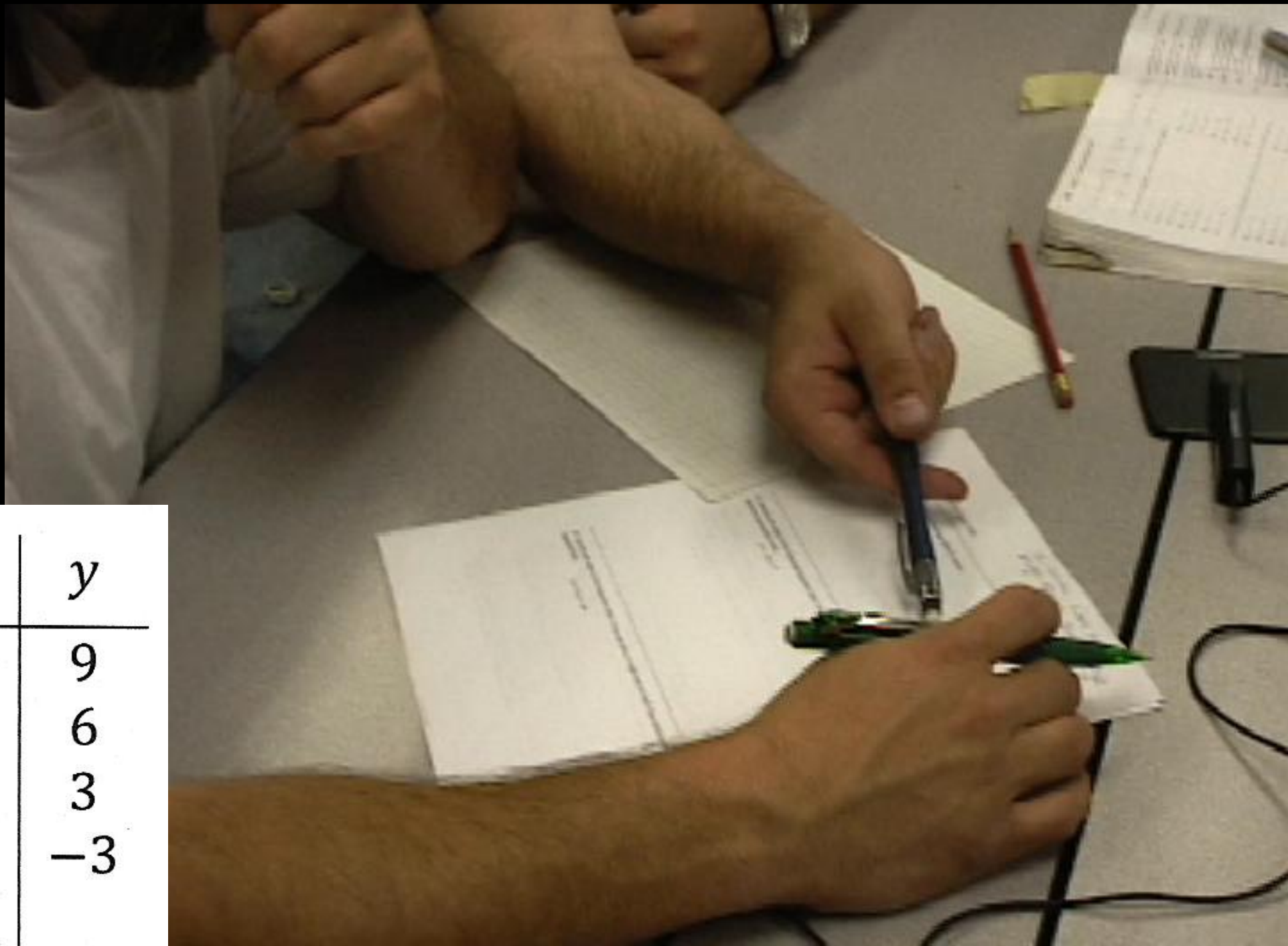
The slope is, $\frac{1}{5}$ to $\frac{2}{10}$

Note: So, if you look at the example on the board, you see how they are separated? You have the X values and Y values. They move in their own ratios.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Nate: So the X is the 1. In this case I do believe the -3 might be correct. We have -2 is 9; -1 is 6.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Nate: Going up one; going down three. Going up one; going down three. Hence the 1 the -3 . That's the ratio.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Alison: I am kind of lost.

Nate: -2 and 9. If we go up one here we go down three here. *Allison:* Oh! *Nate:* That's the 1 to -3 ratio.



| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Phil: How does this coordinate up and down? You have three between 9 and 6. You have three between 6 and 3. But then you have six again here.



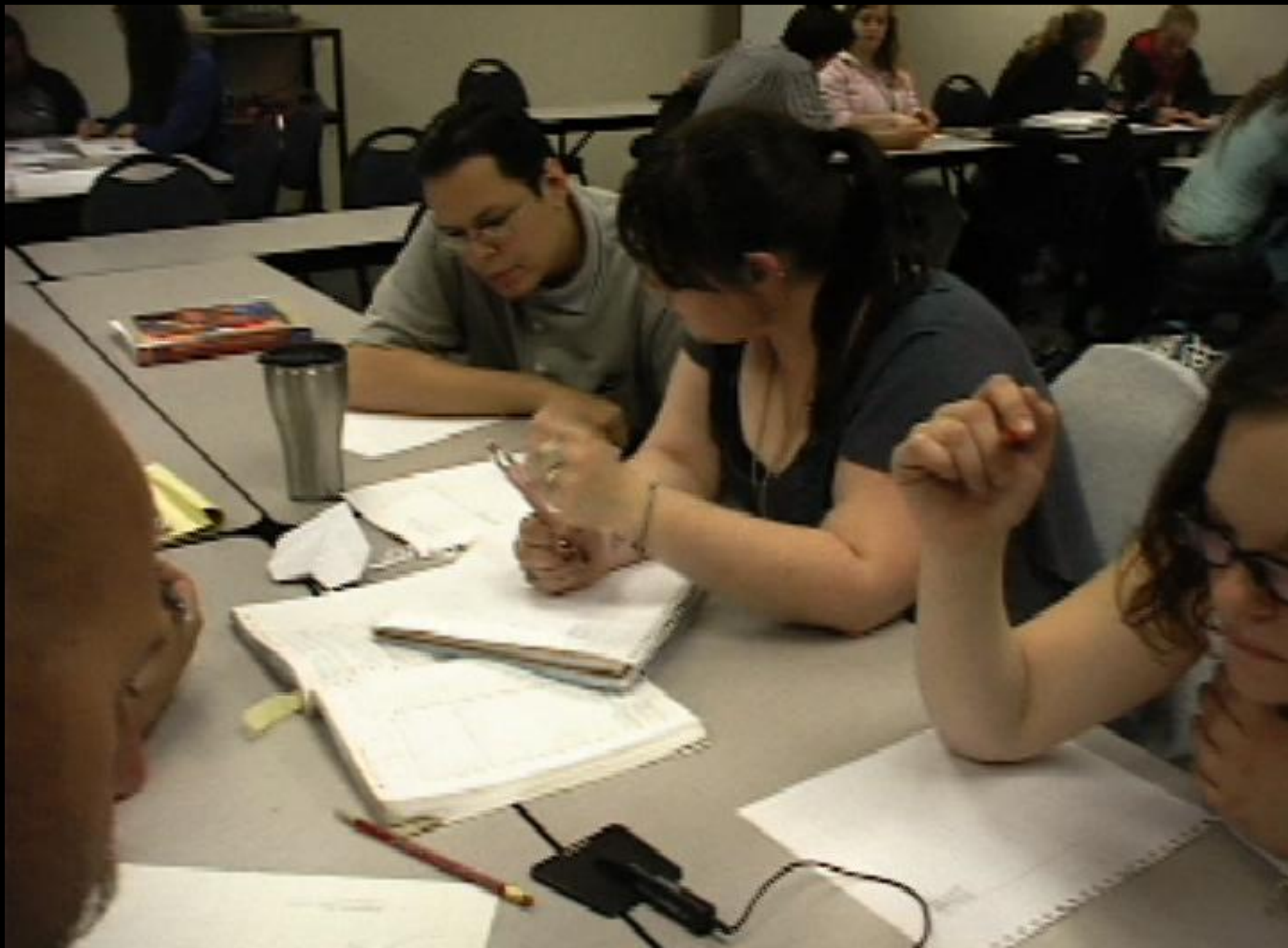
| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Nate: Right. But that is only because we have that arbitrary jump between 0 and 2 that we have six here. If we had 3 we'd have -6. If we had 4, we'd have -9.

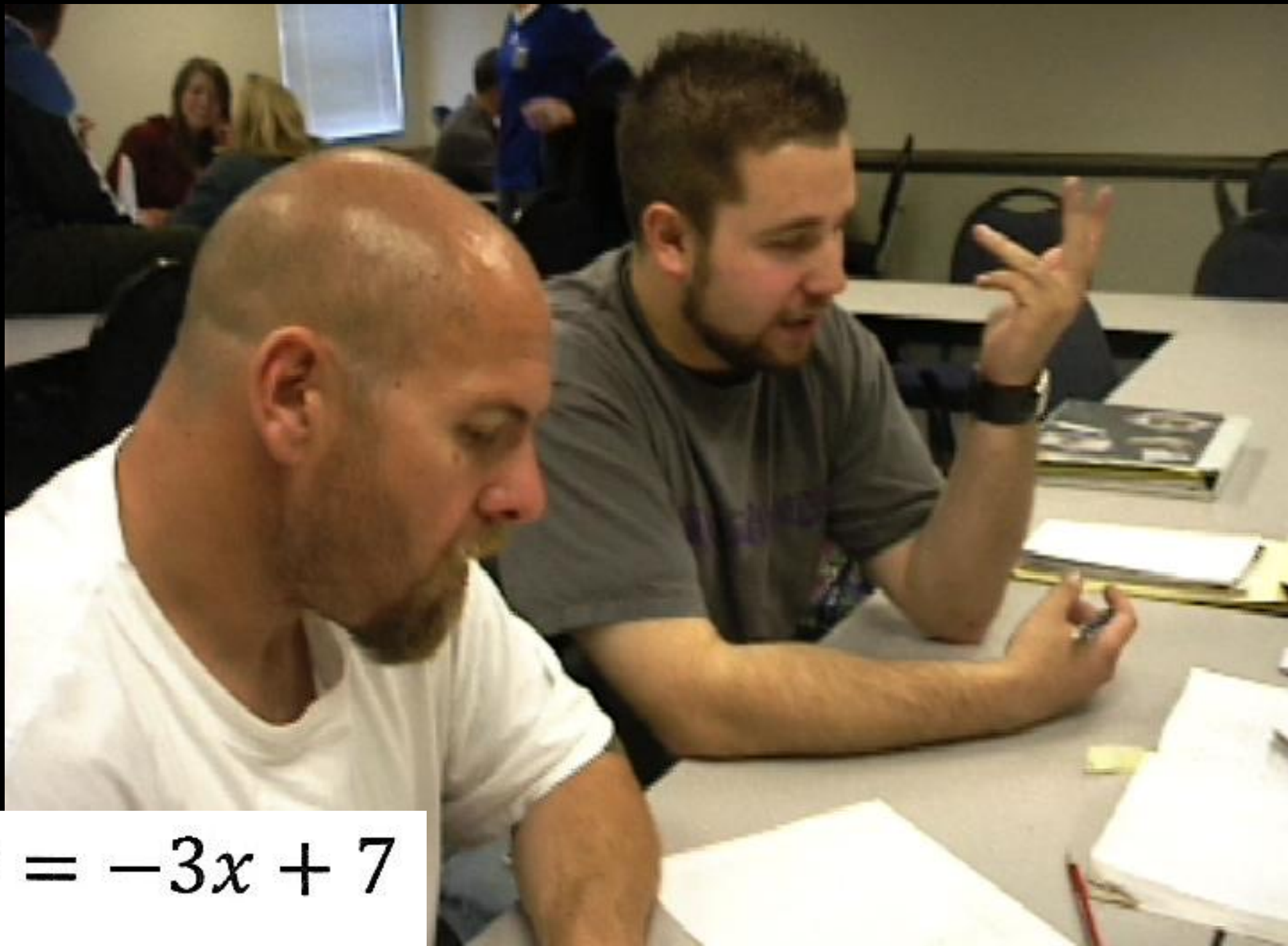


| x | y |
|-----|-----|
| -2 | 9 |
| -1 | 6 |
| 0 | 3 |
| 2 | -3 |

Phil: So we have a slope of 1 to -3.



Megan reads: “Describe the slope of the following equation. If you are stuck it might help to find a few solutions to the equation first.” $y = -3x + 7$



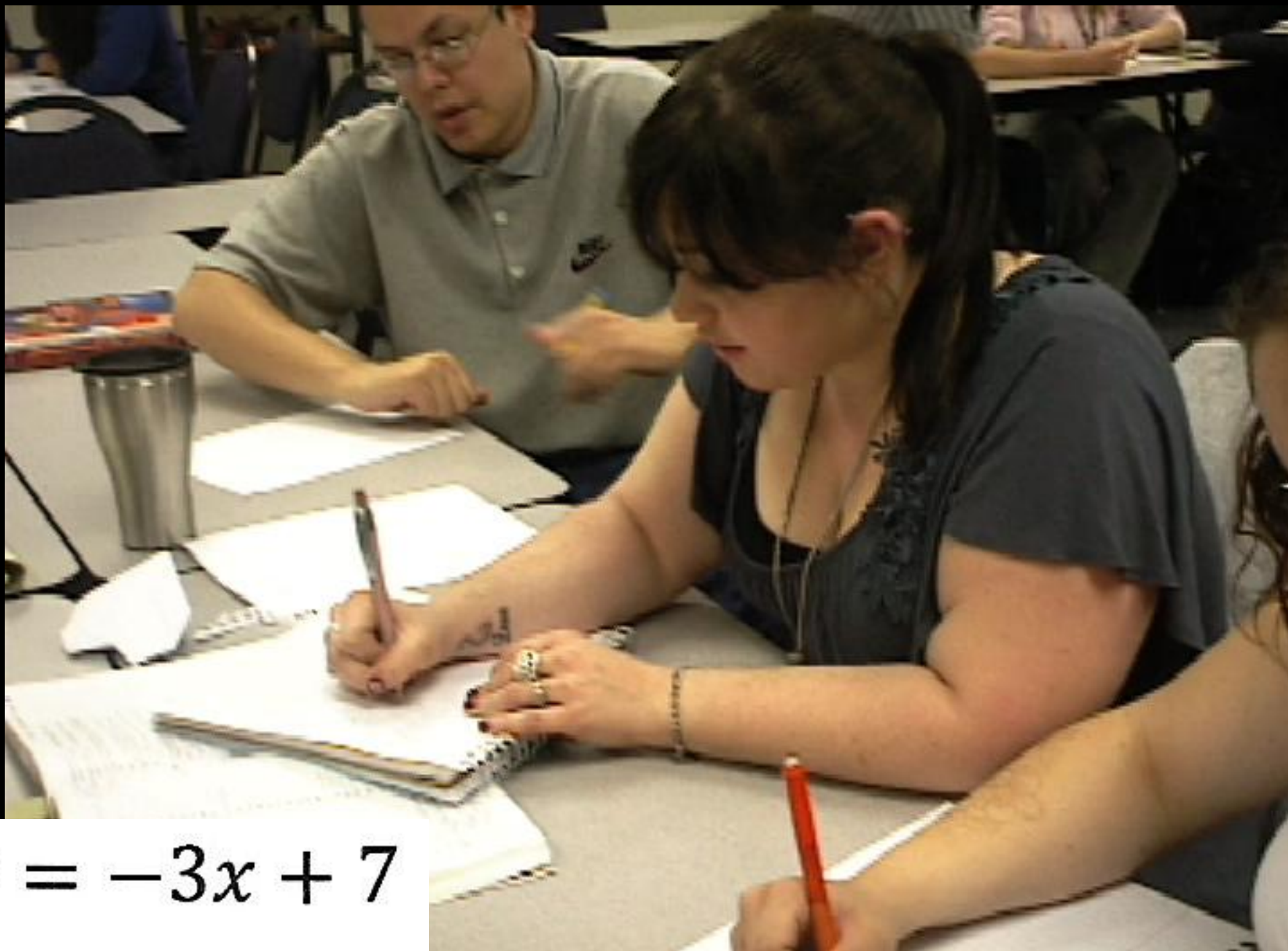
$$y = -3x + 7$$

Nate: That's really easy. Let's plug in 1 for y and solve. Then we can plug in 2 for y and solve.



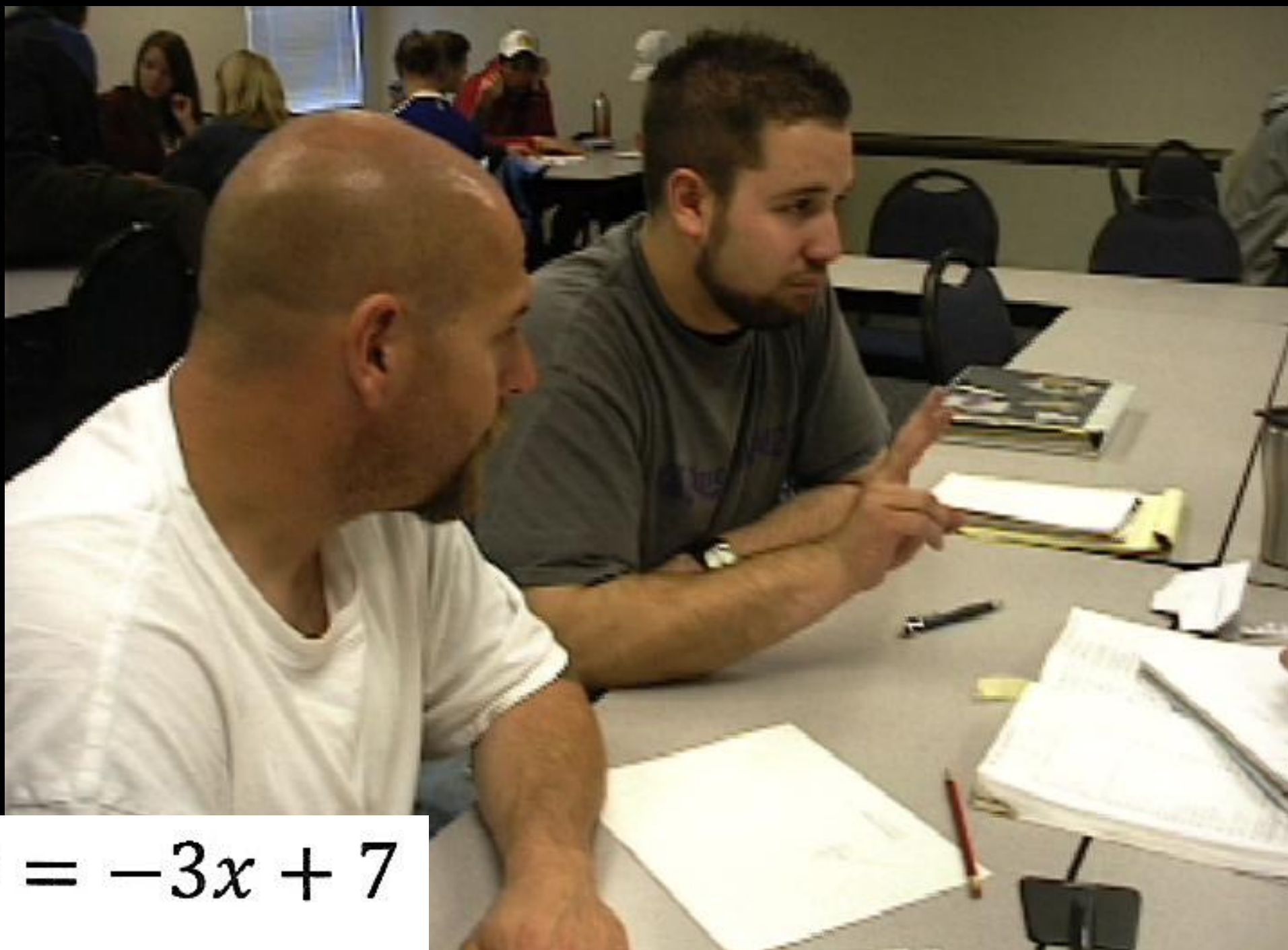
$$y = -3x + 7$$

Phil: We can plug in 0.



$$y = -3x + 7$$

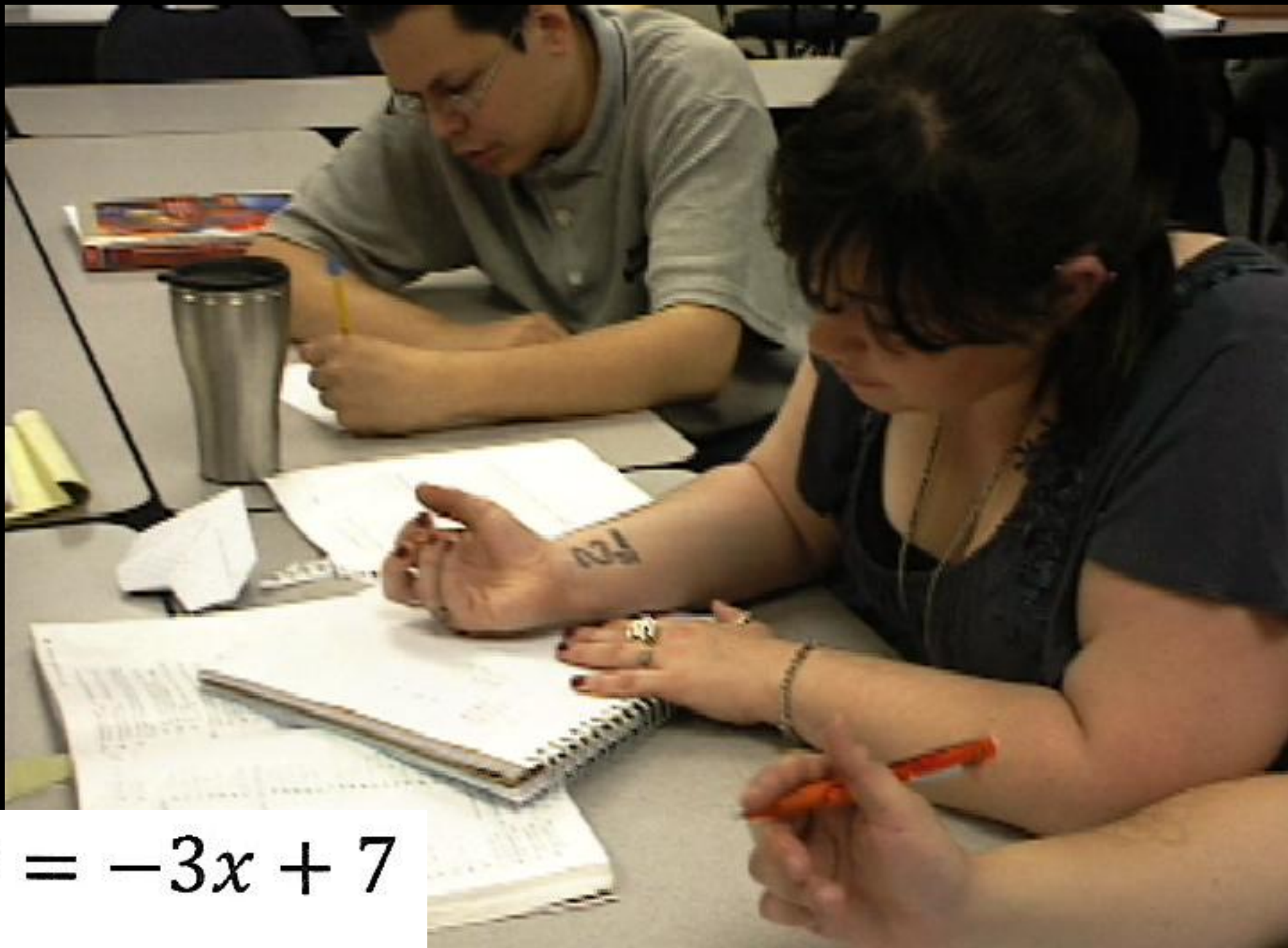
Megan writes and speaks: $1 = -3x + 7$



$$y = -3x + 7$$

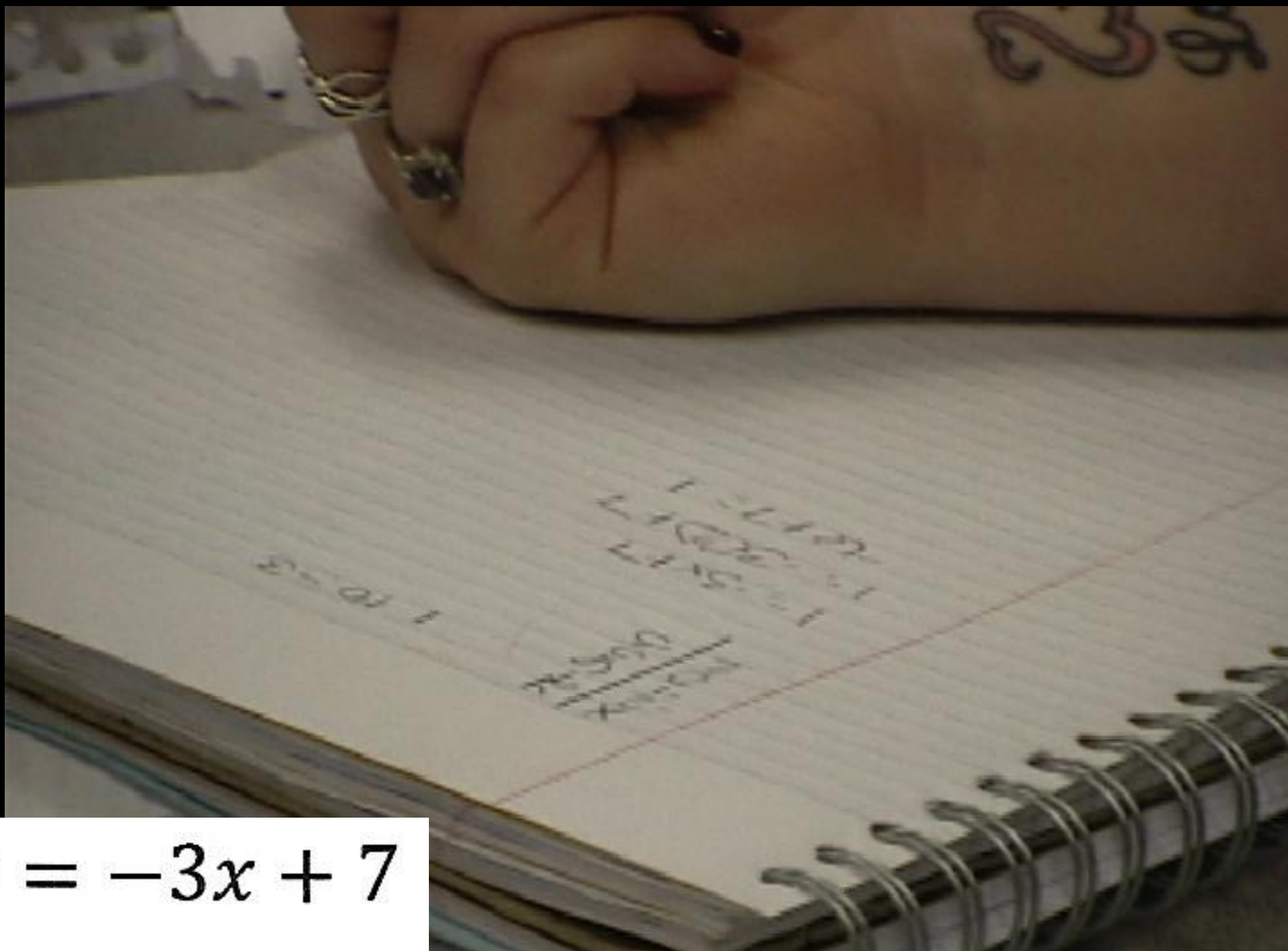
Nate: It's pretty easy. What times (-3) plus 7 equals 1?

Megan: 2.



$$y = -3x + 7$$

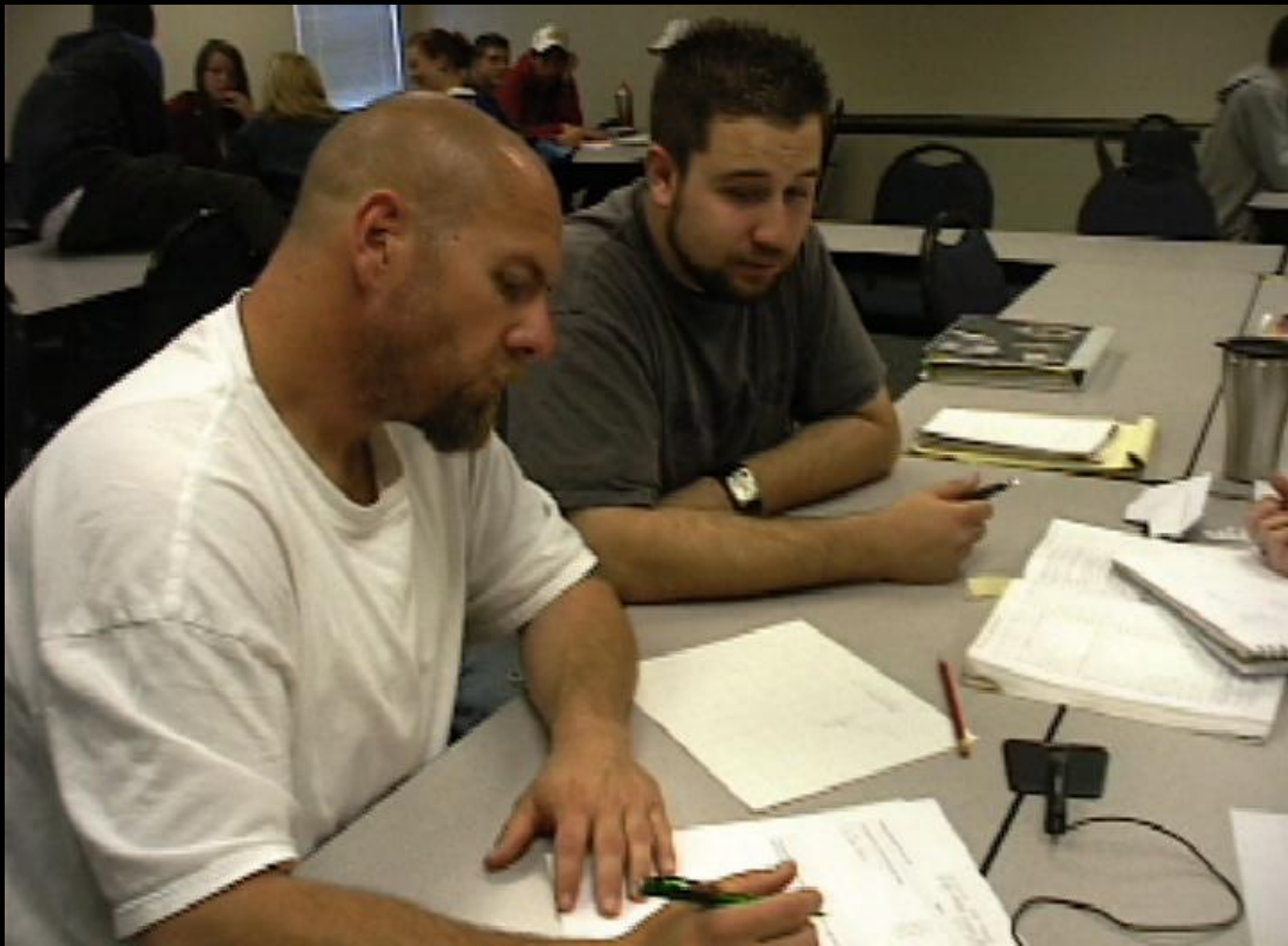
Megan writes and speaks: $1 = (-3)(2) + 7$



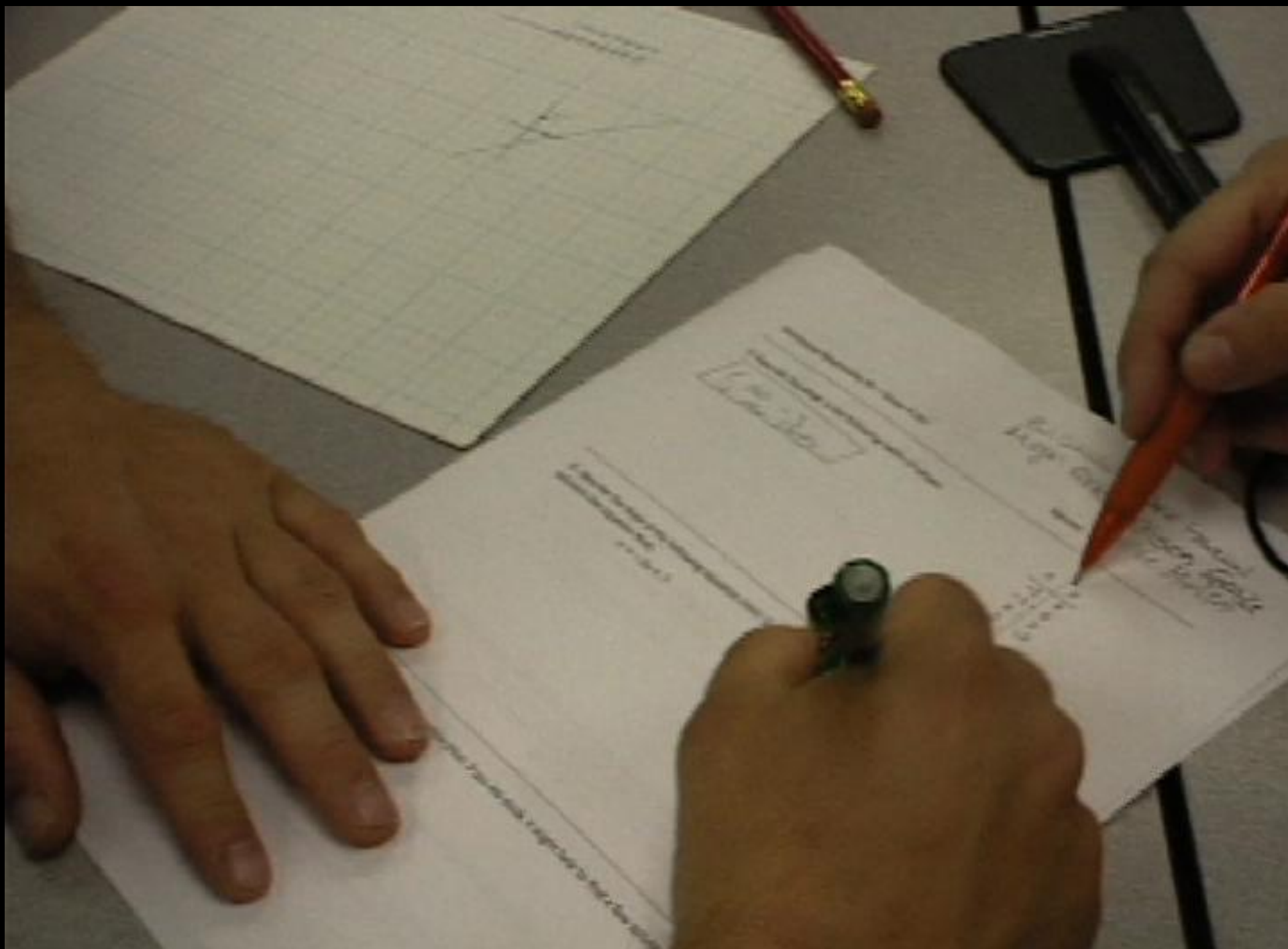
$$y = -3x + 7$$

Nate: $1 = -6 + 7$

Allison: Oh. Oh yeah!



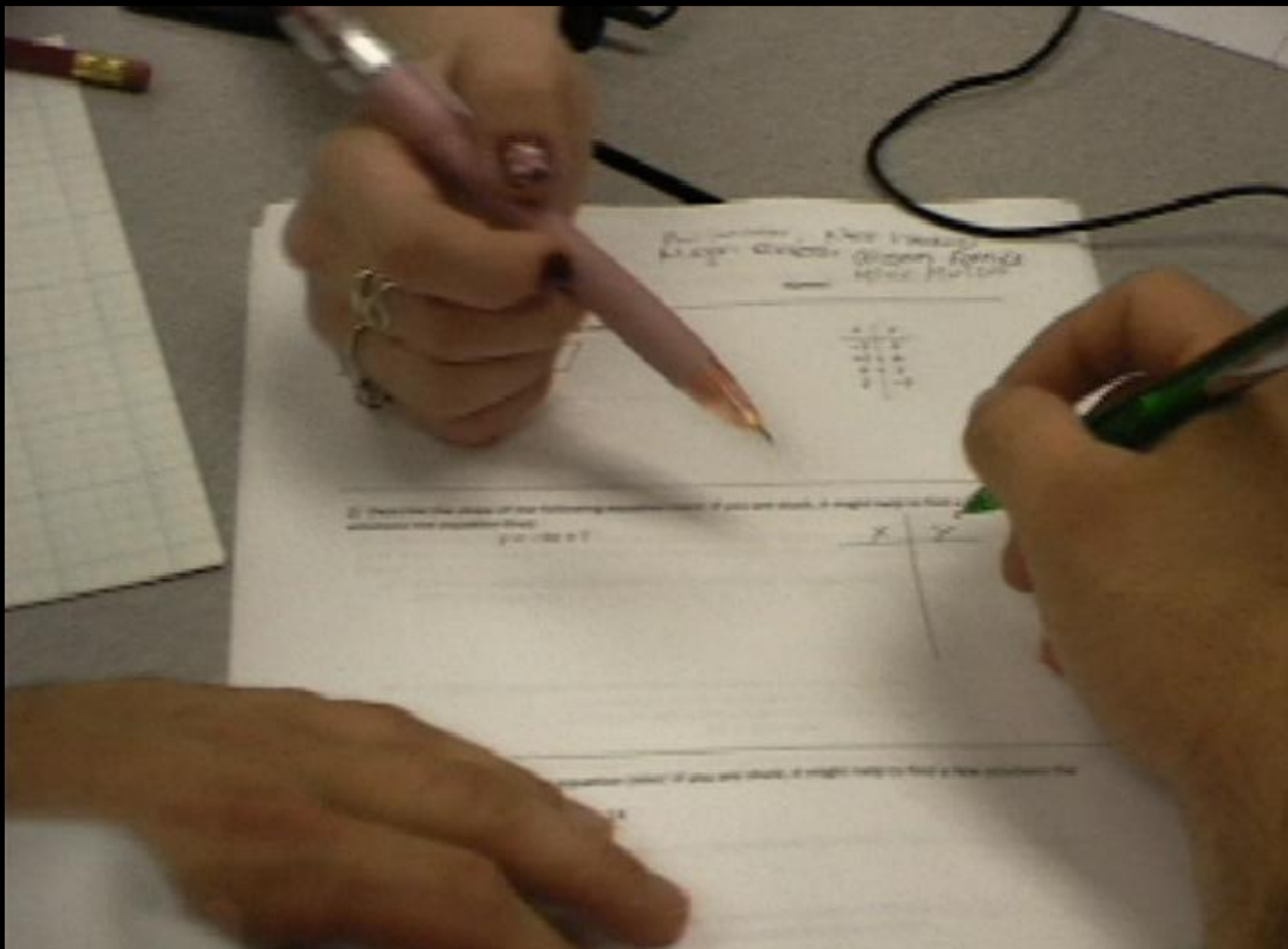
Nate: So in that case, if y is 1, x is 2.



Mike writes: $y = 1, x = 2$.

Megan: Write it like this.

Alison: I like this set up. It is easier to read.

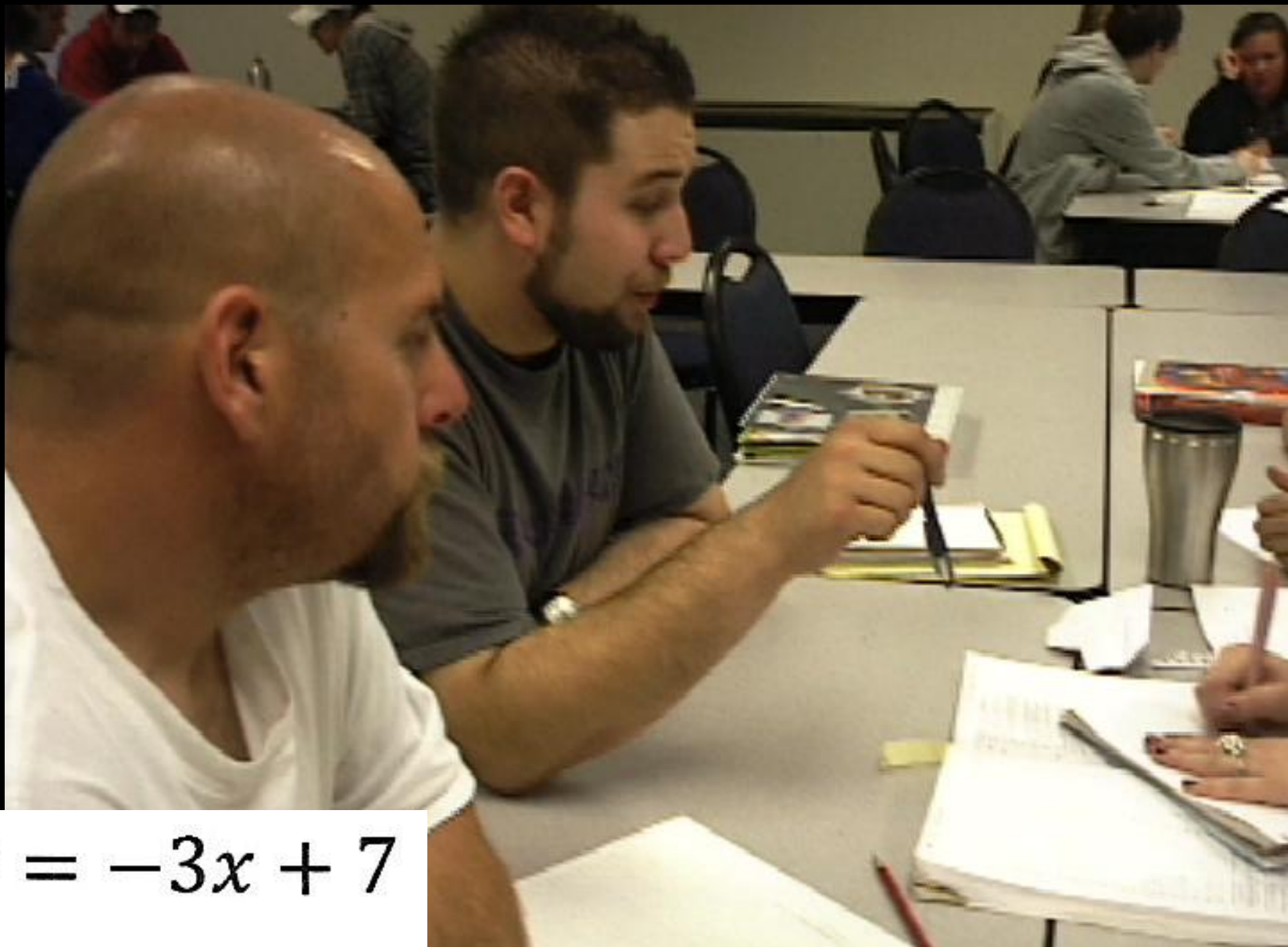


Megan: Y is 1. X is 2. So when Y is 2, X is 4.



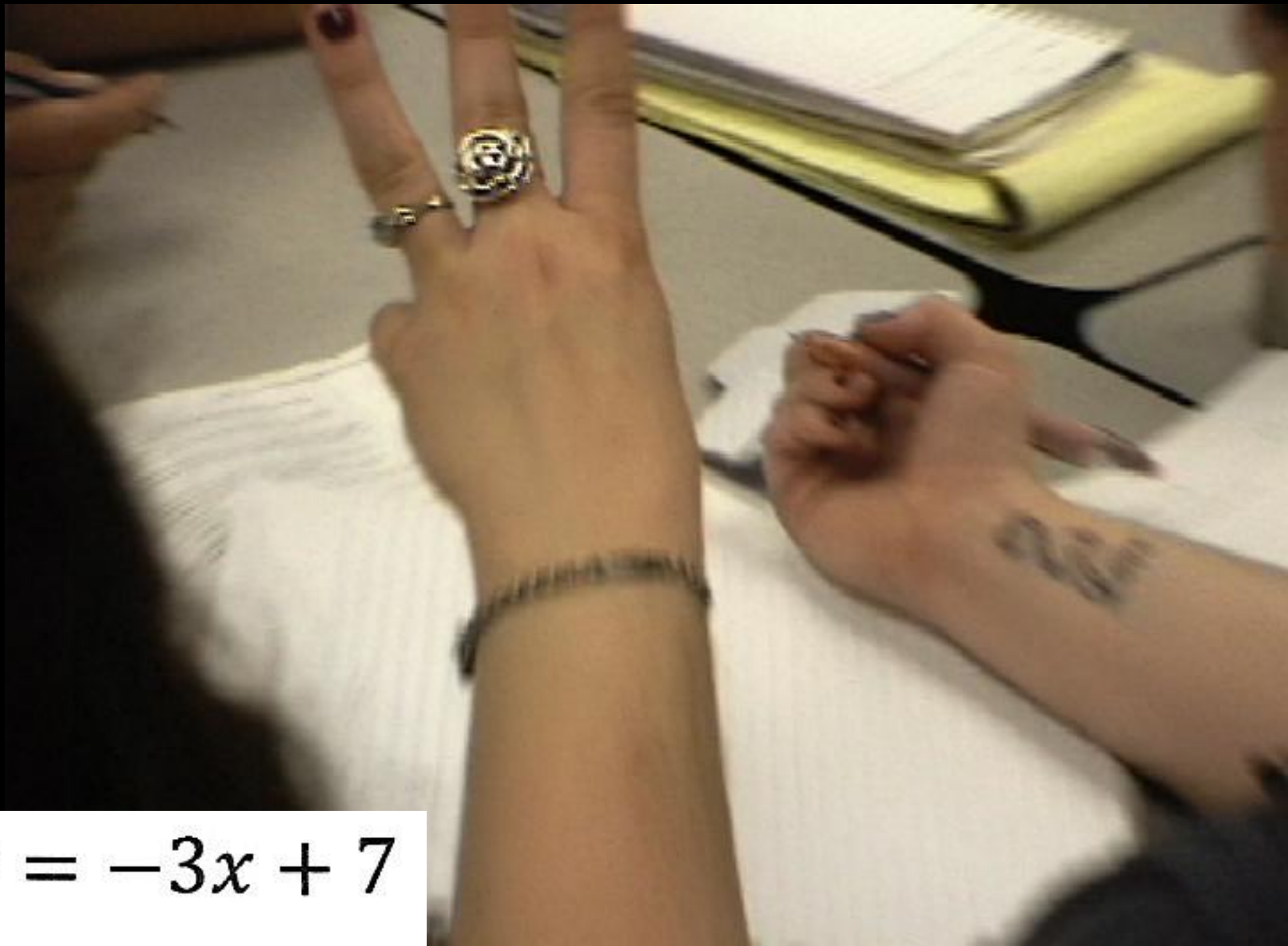
$$y = -3x + 7$$

Megan writes and speaks: So you get $2 = (-3)(4)$, which is -12 , plus 7 . *Pause...* Is that right?



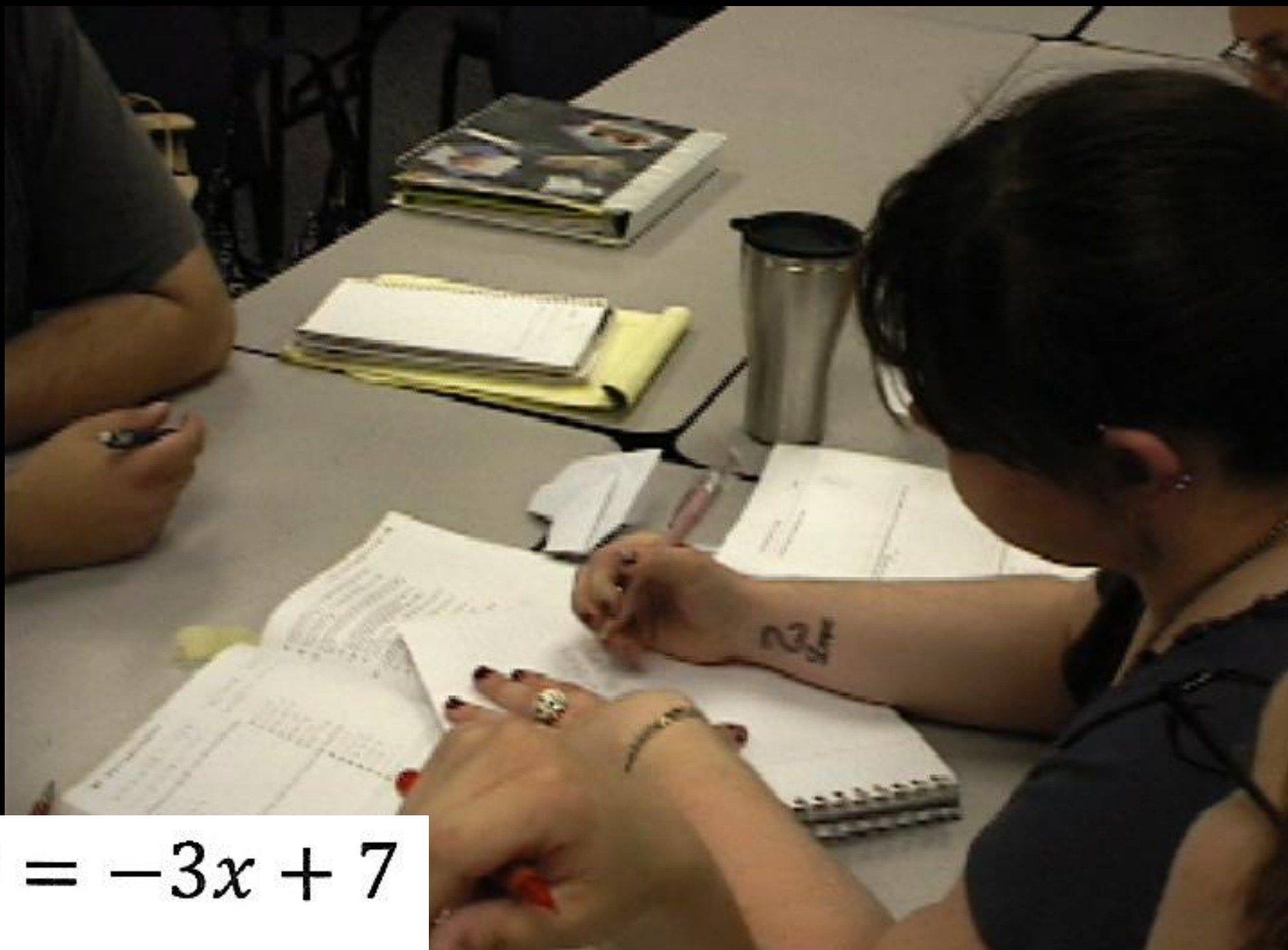
$$y = -3x + 7$$

Nate: We're actually going to have to figure it out. Once we have done two or three of these, we can see the ratio. You just can't guess the ratio, so plug in 2.



$$y = -3x + 7$$

Megan writes and speaks: $2 = -3x + 7$. Three.
Nate: Yes.

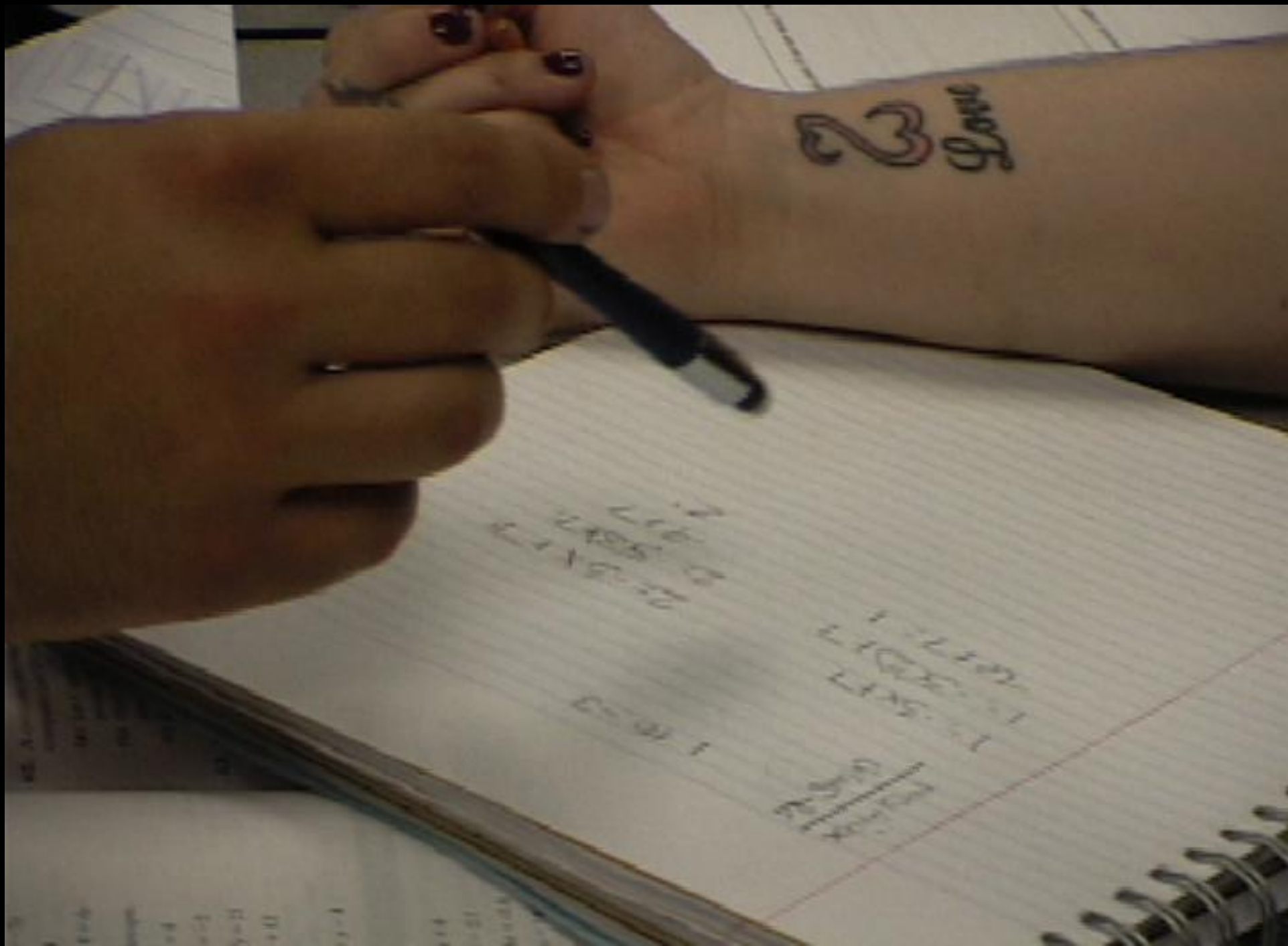


$$y = -3x + 7$$

Megan writes and speaks:

$$\text{So... } 2 = (-3)(3) + 7.$$

$$\text{So... } -9 + 7 = 2$$



Nate: Actually it would equal -2 .

Megan: Why?

Nate: Think about it.

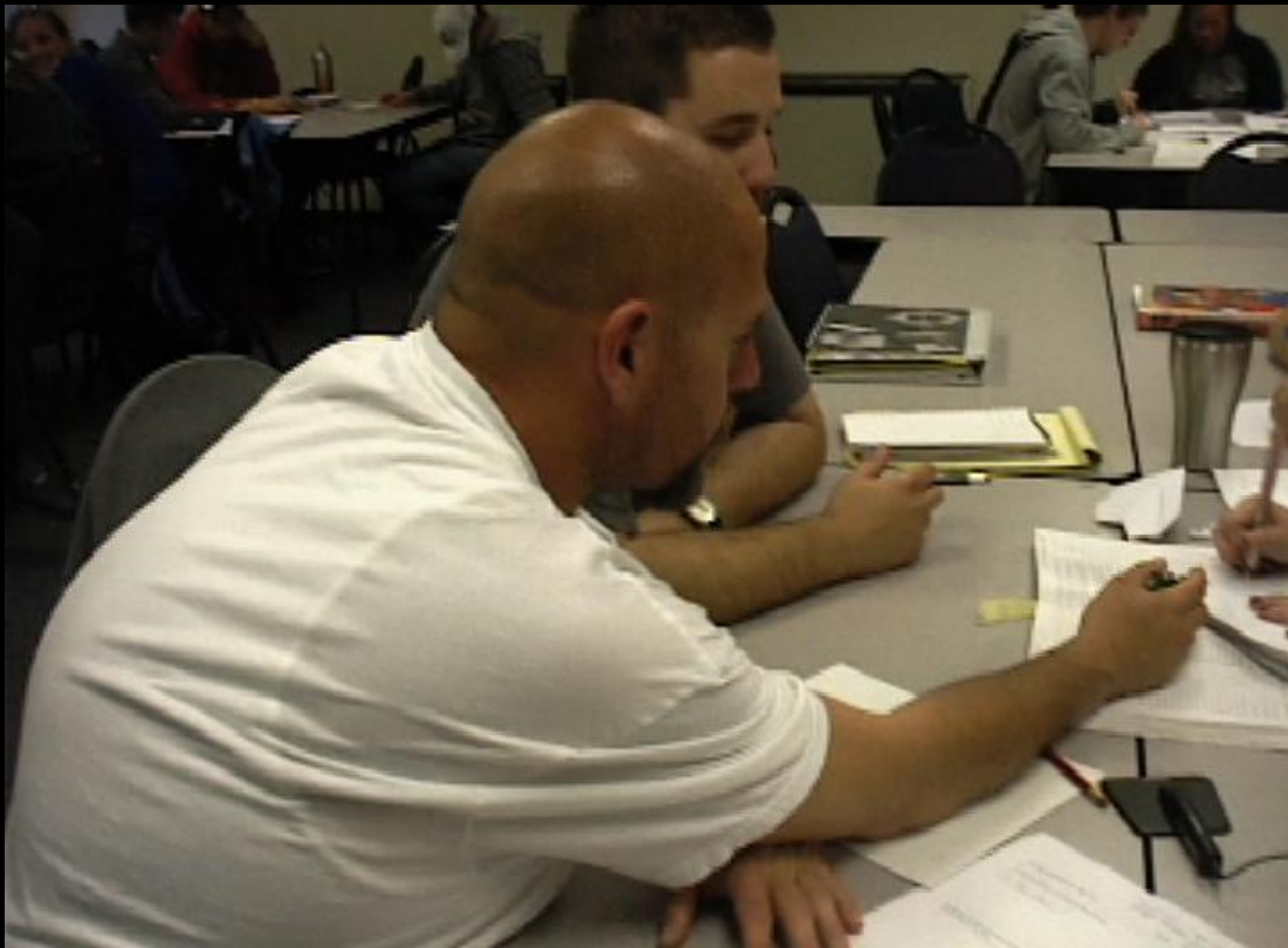


$$y = -3x + 7$$

Alison: The 9 is bigger than the 7.

Megan: So would it be -3 ?

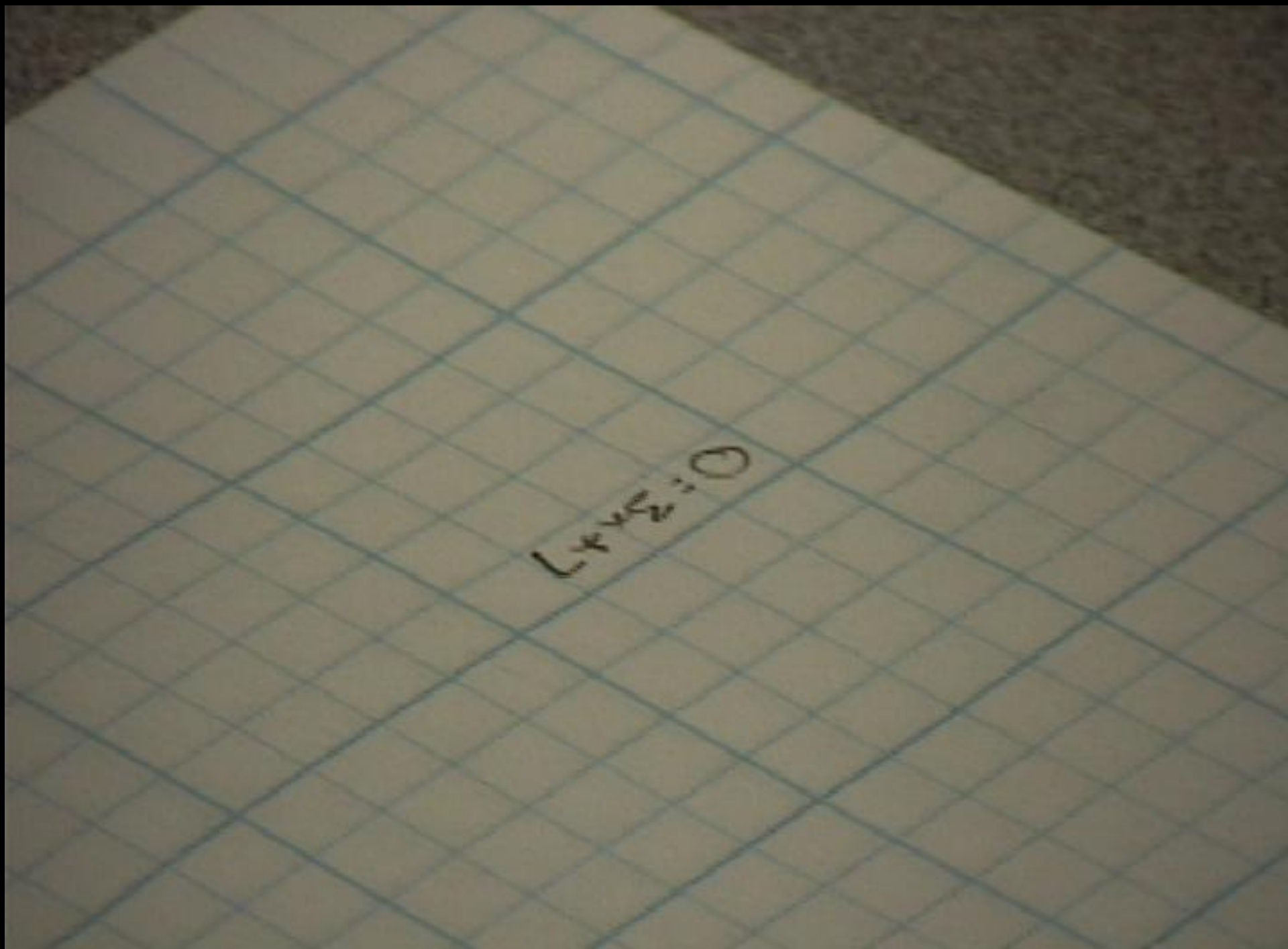
Nate: That would be $9 + 7$.



Mike: The easiest way to start that is to plug in 0.



Nate: Why don't you do the 2, and we will work on 0 over here. Delegate.



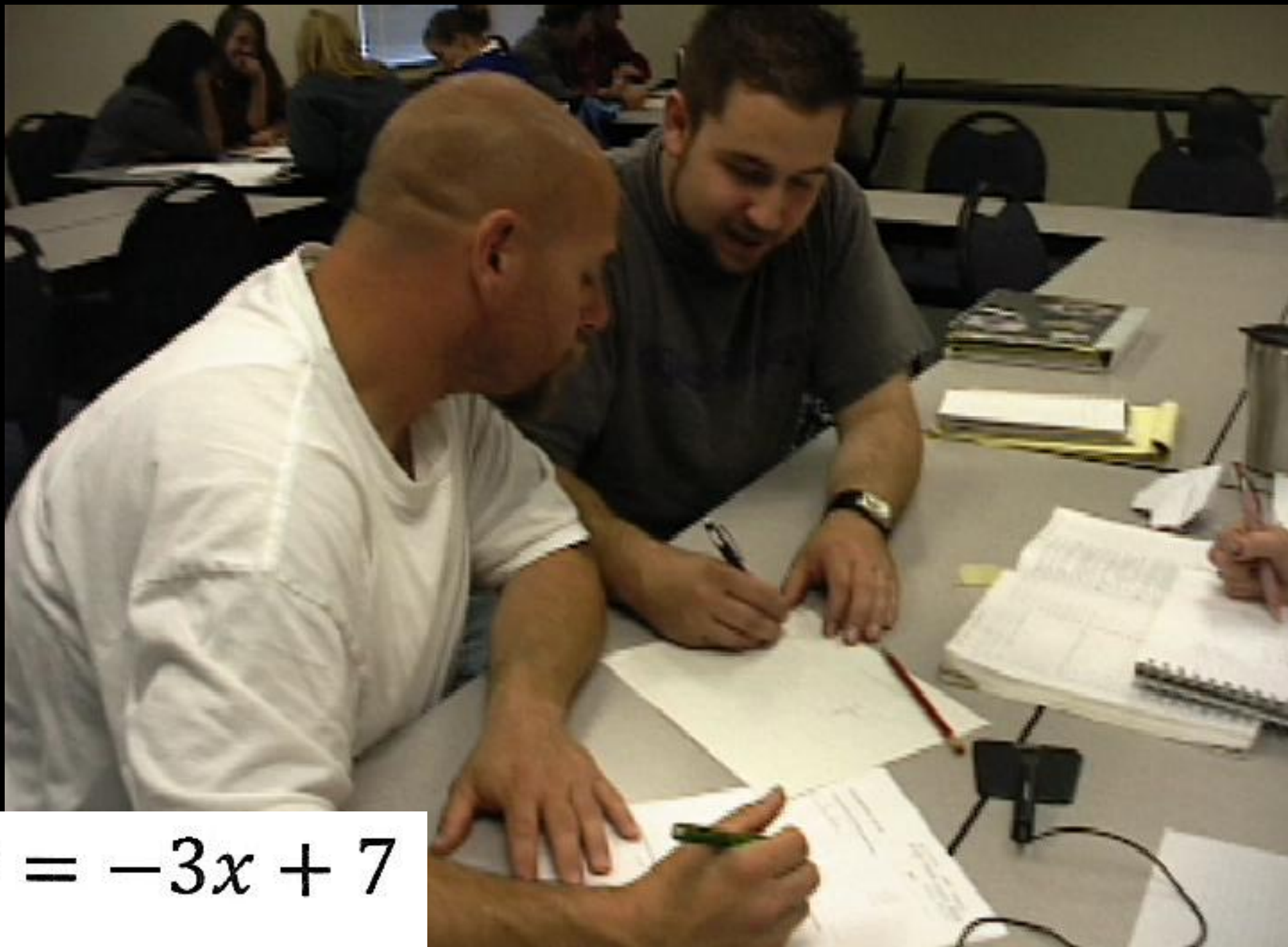
Nate: So what is 3 times something equals 0? So what times 3 is 7?

Mike: 3.5. *Nate:* No. *Mike:* 2.5. *Nate:* There you go.



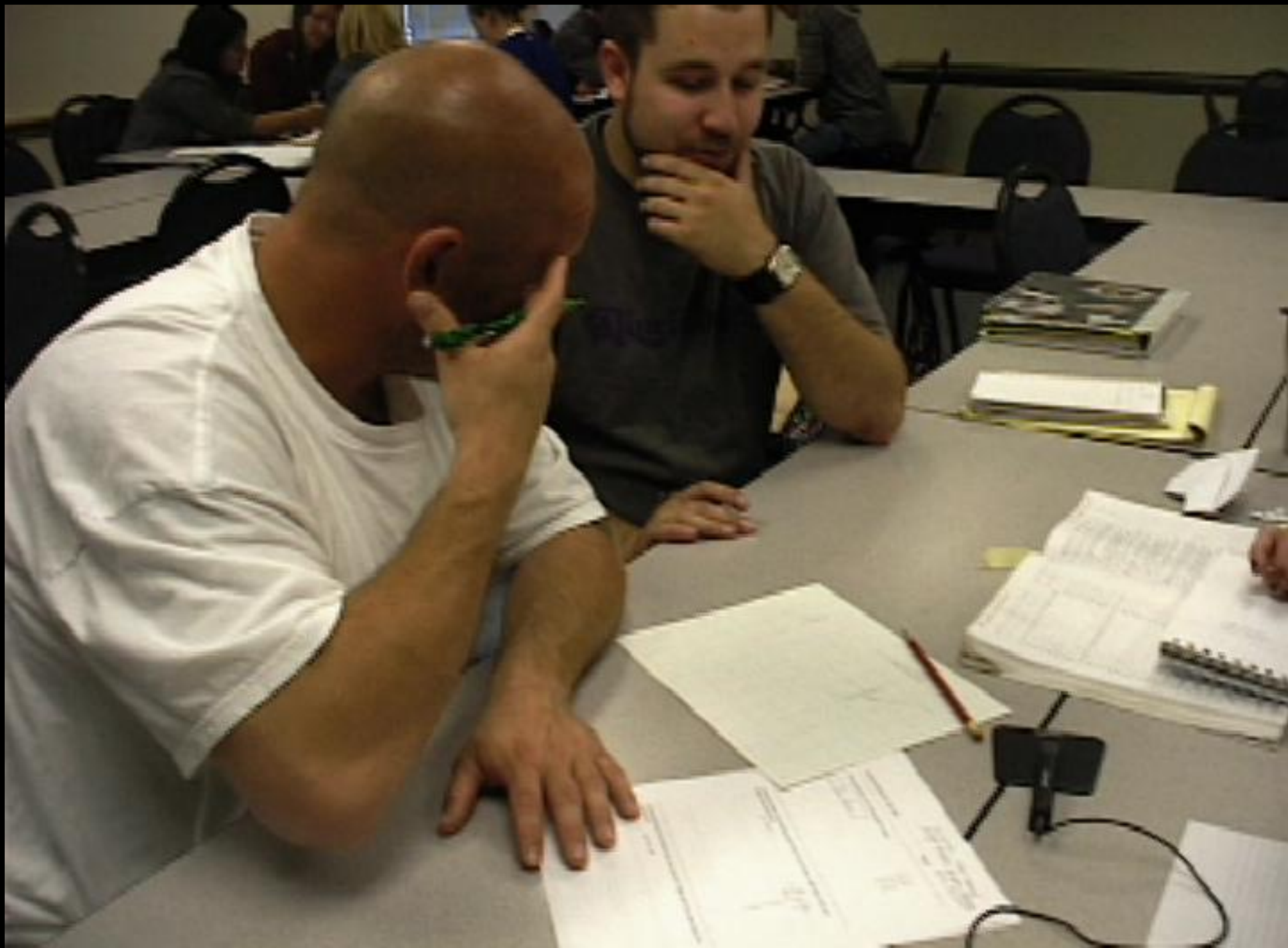
$$y = -3x + 7$$

Megan to Alison: $(-3)(2)$ gives you -6 .
So we did that. Now what?

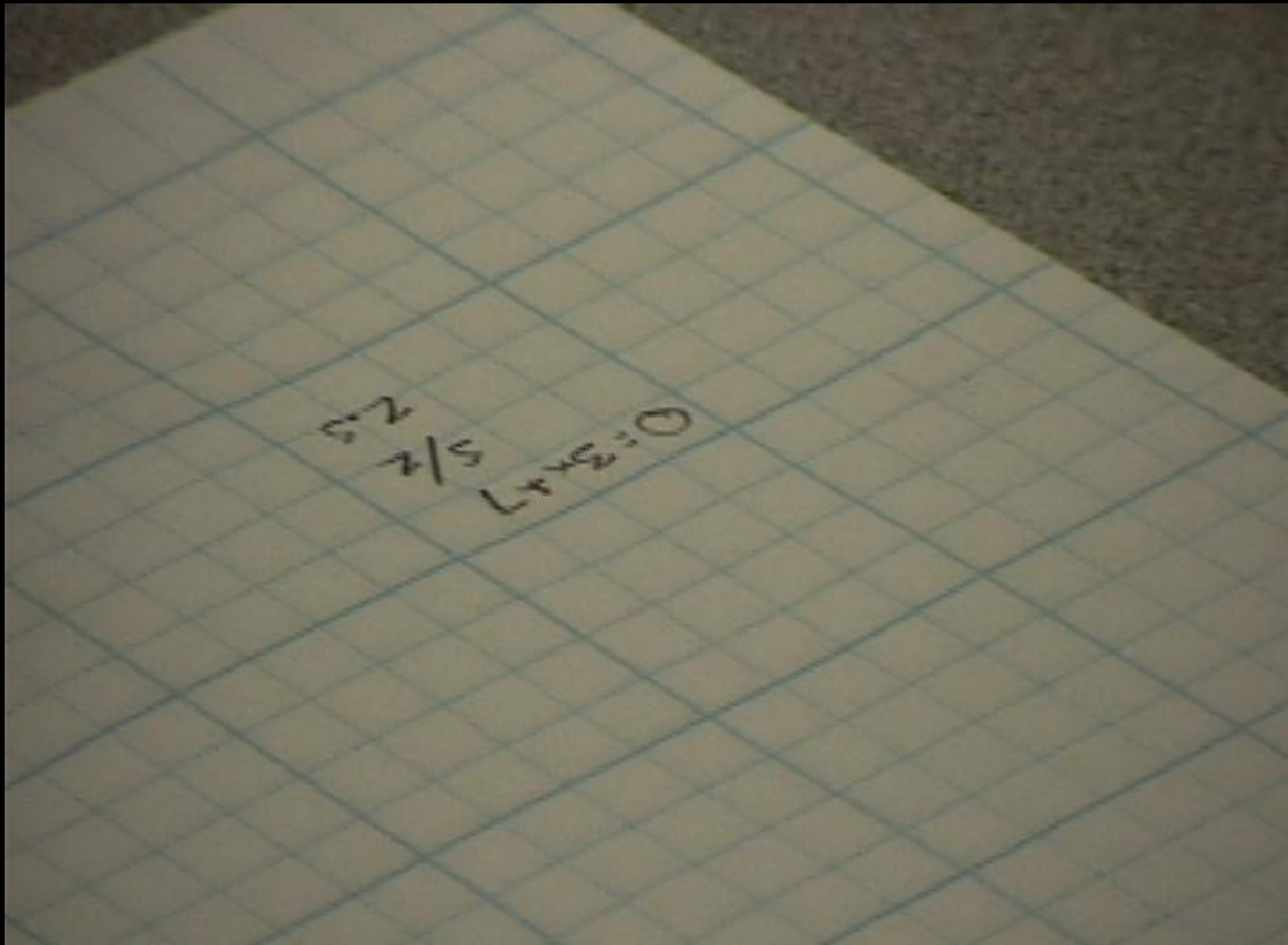


$$y = -3x + 7$$

Nate to Mike: In this case we can do $5/2$.



pause

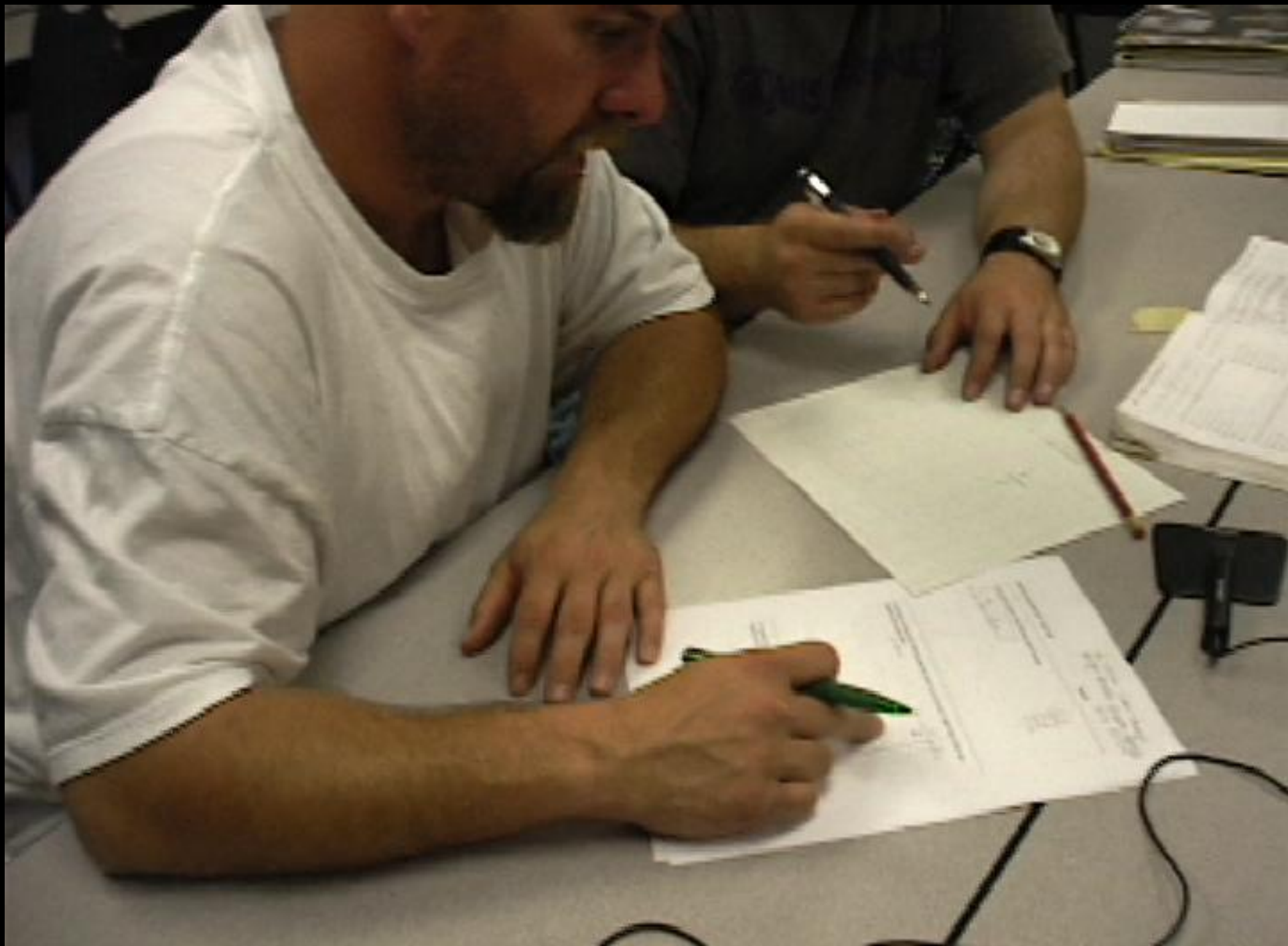


Mike: So we are going to have $x = 2.5$?

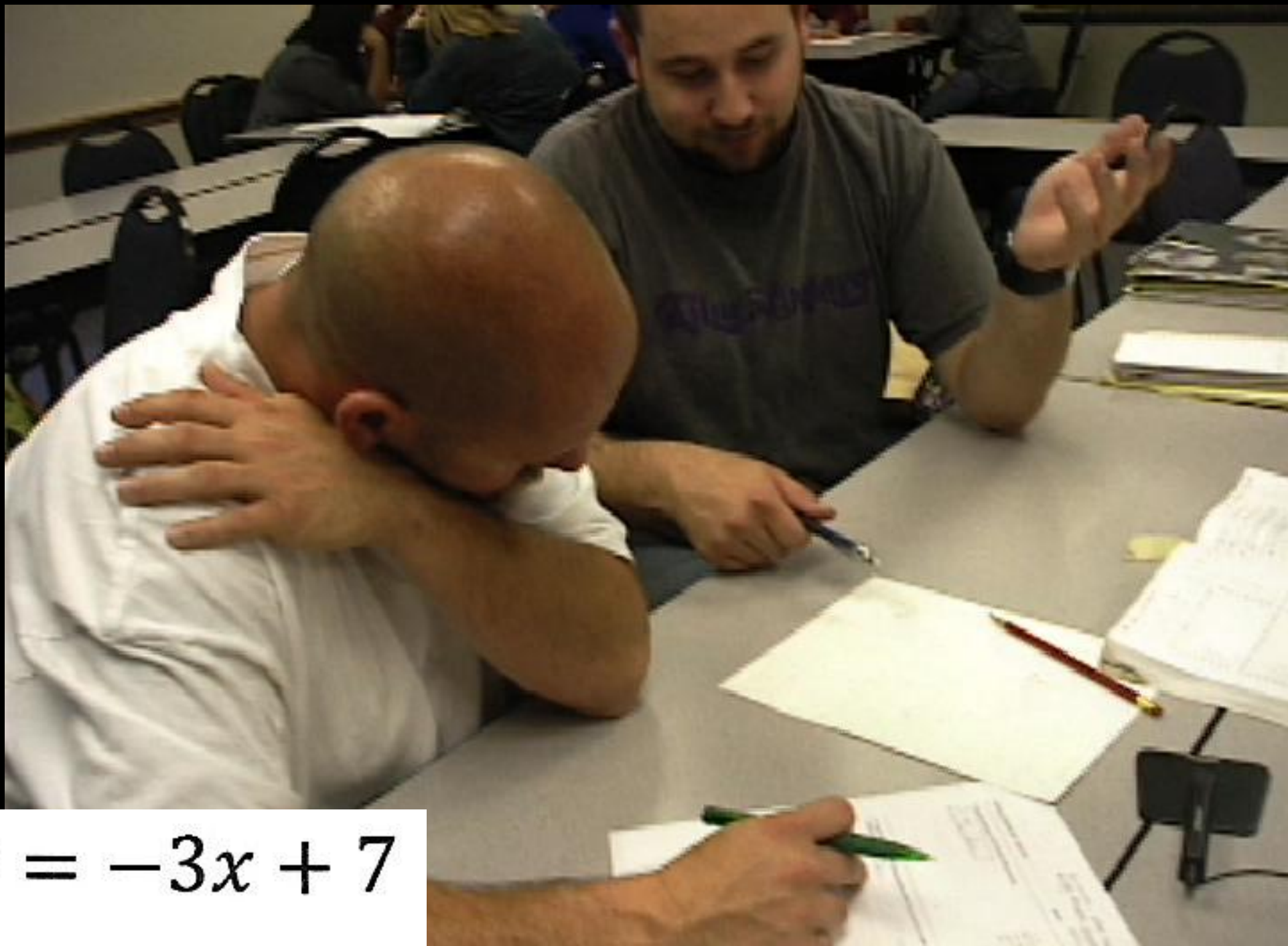
Megan: You guys, What are you doing?



Nate: Wait second, Mike. This doesn't make sense to me.



Mike: We're struggling a bit on this one for some reason.



$$y = -3x + 7$$

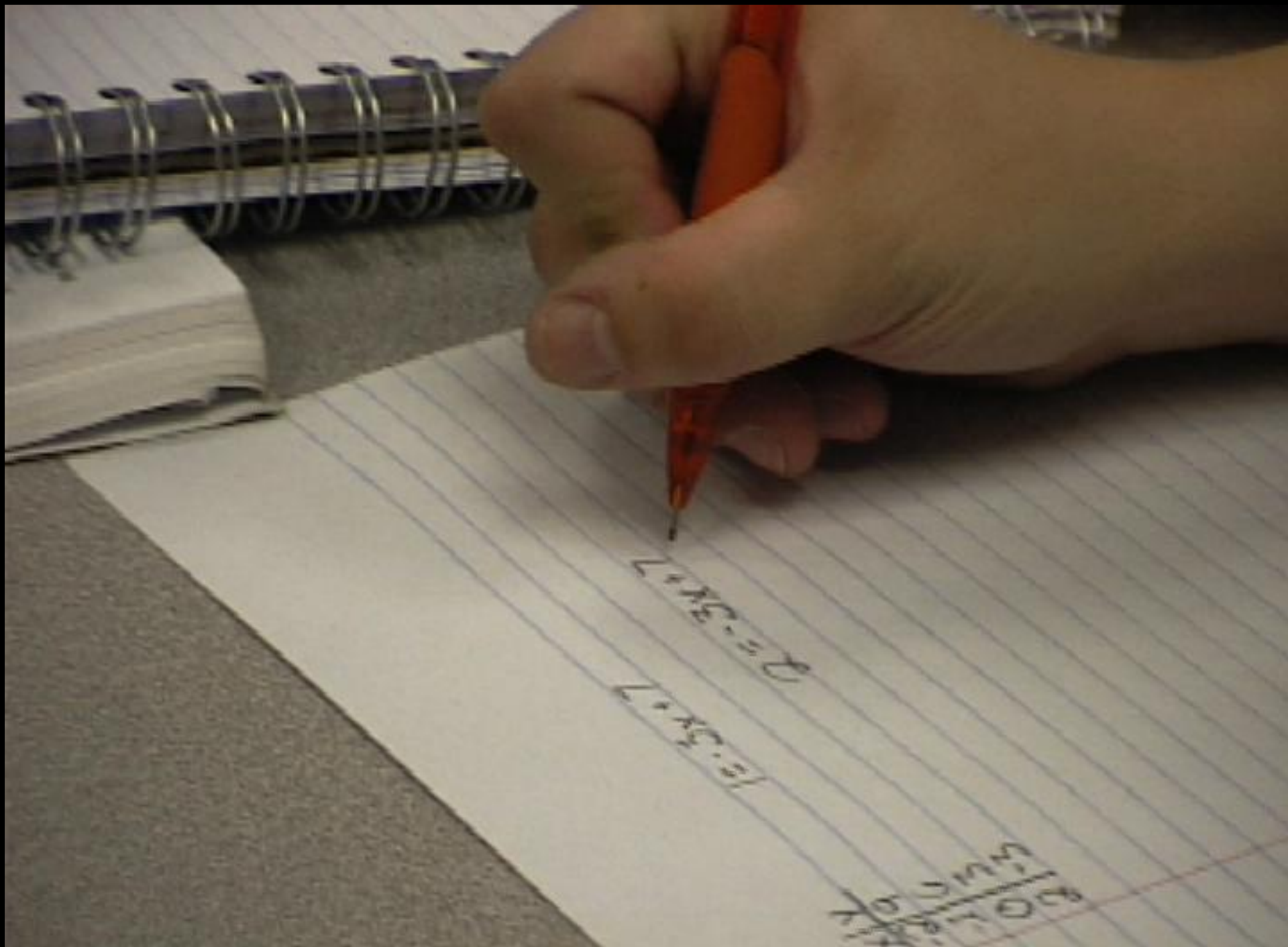
Nate: $(3)(7/3)$ is going to be $21/3$, so its going to be 7.

Mike: So, $7/3$?



Phil: I plugged 2 in there and got $-5/3$.

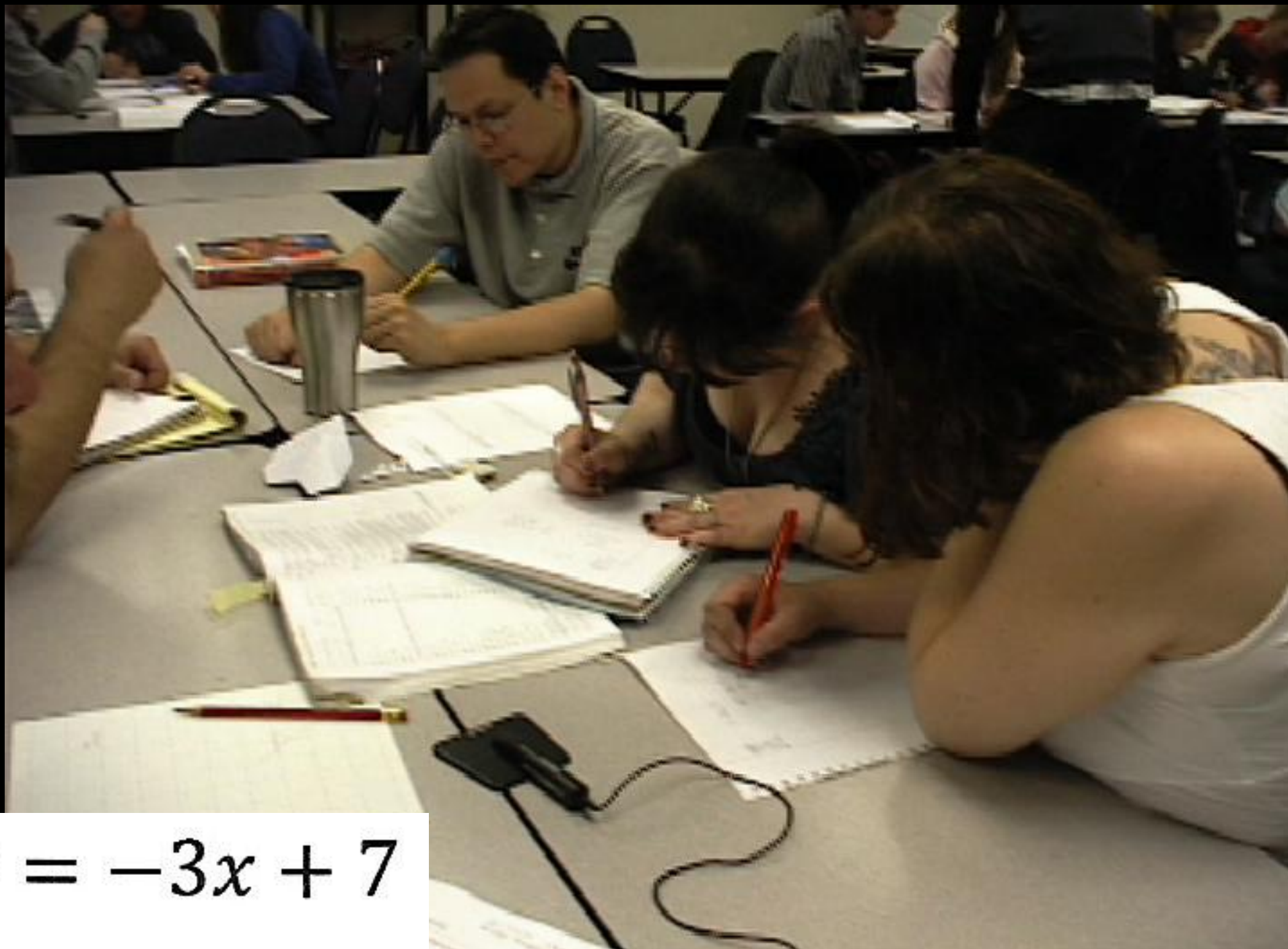
Megan: So that would be 5 over -3 .



Alison writes and speaks: $2 = 3x + 7$.

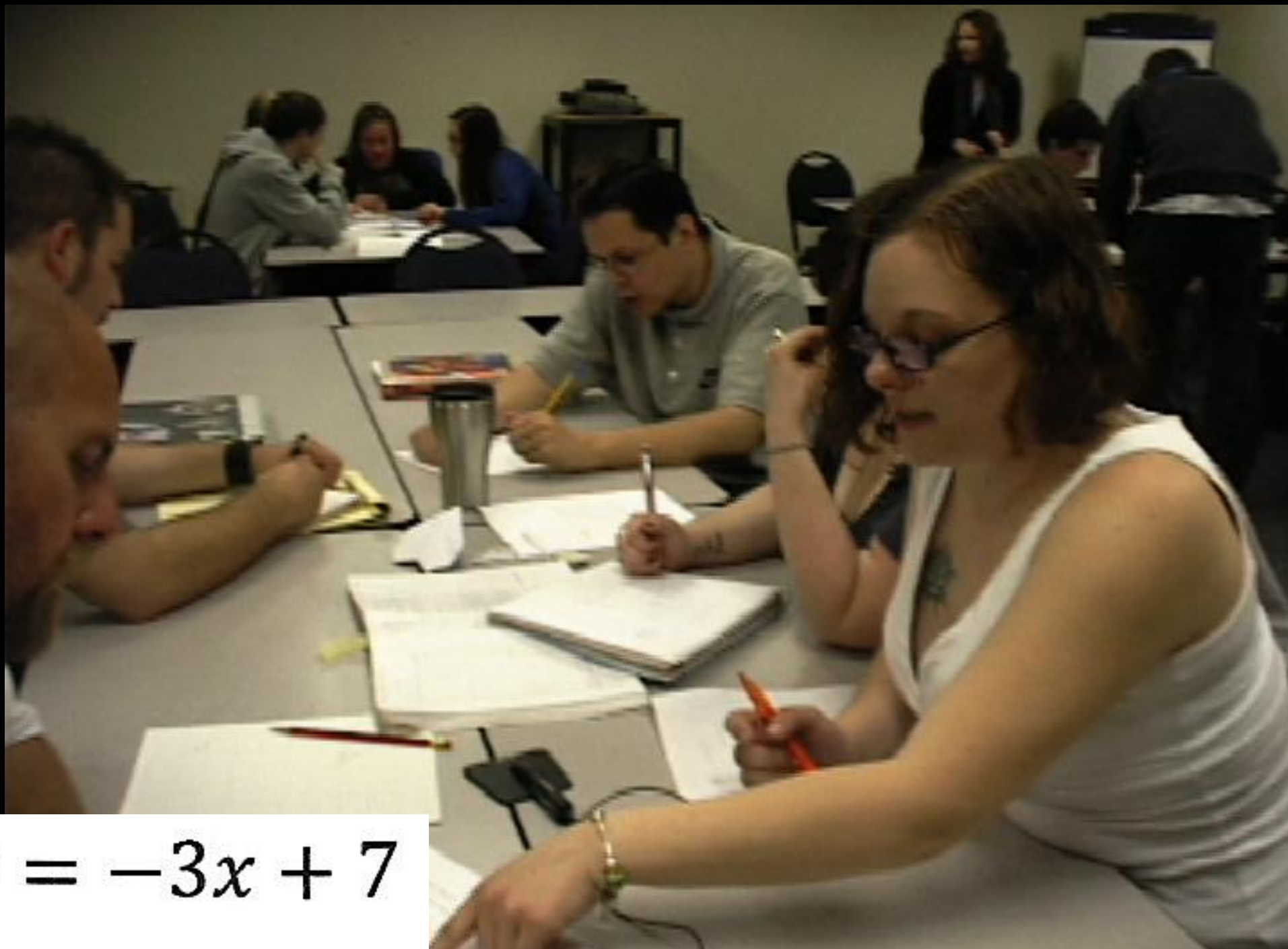
Megan: It's going to be a fraction.

Alison: I hate fractions.



$$y = -3x + 7$$

Alison watches Megan complete the problem.
Megan: It will be $-5/3$.



$$y = -3x + 7$$

Alison: X is $-5/3$; Y is 2.



Nate: So we have three of them. Let's figure out what the pattern is now.



Alison: I have no idea how to do this, because fractions are involved.

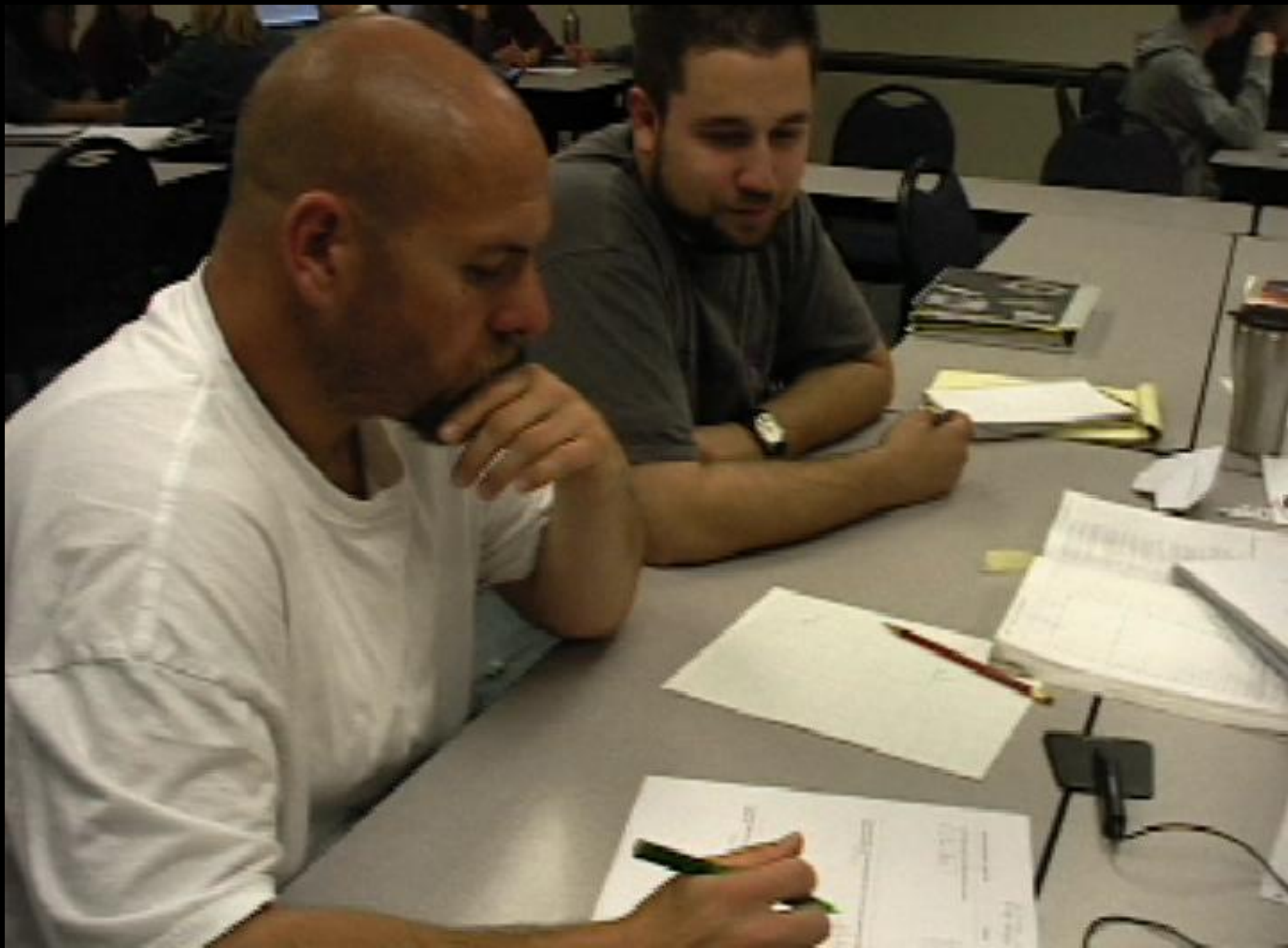
Megan: Turn the fractions into decimals.



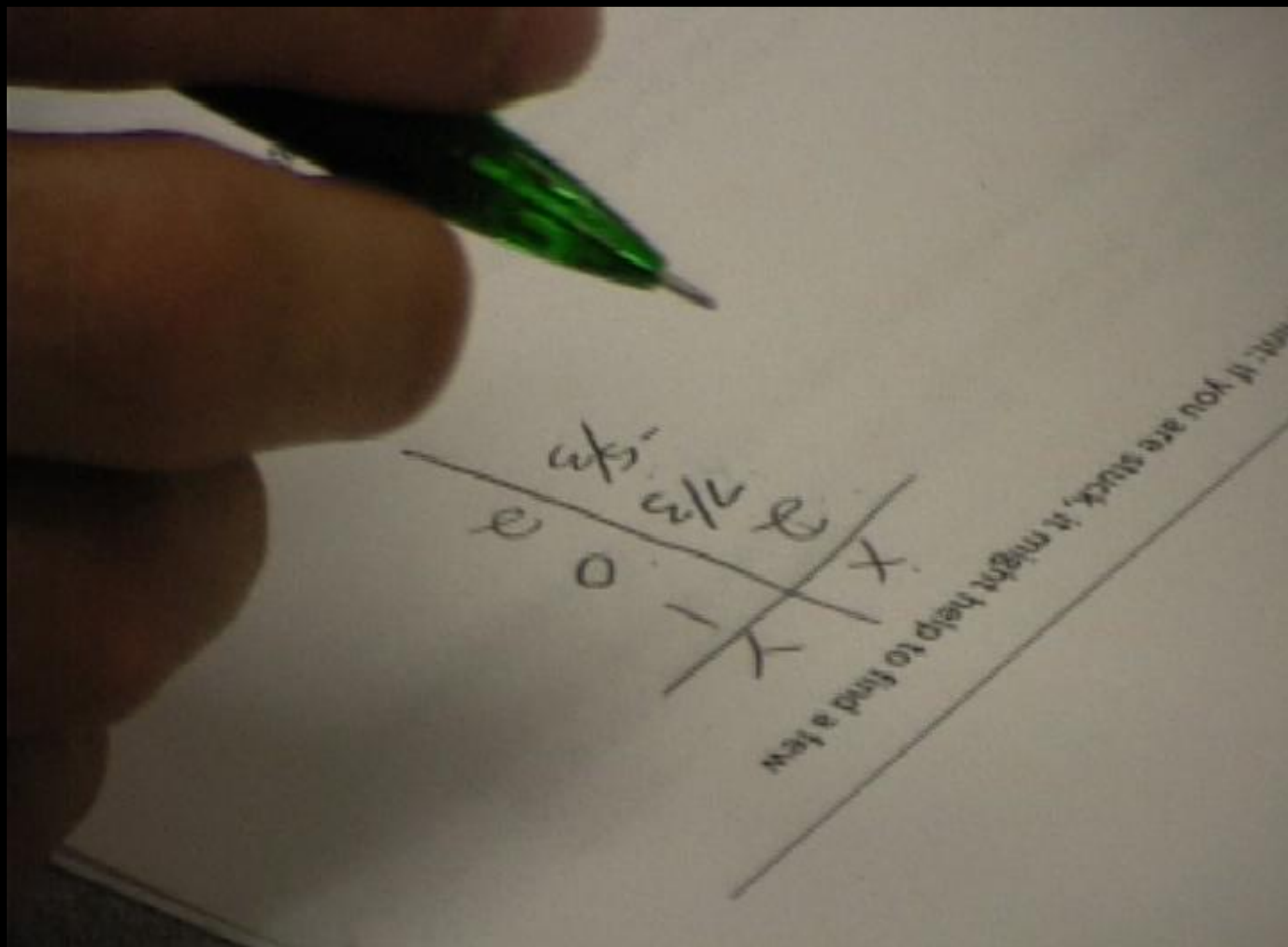
Nate: When you do thirds, you have a
endless number of threes.



Megan: But still, can't you do it?



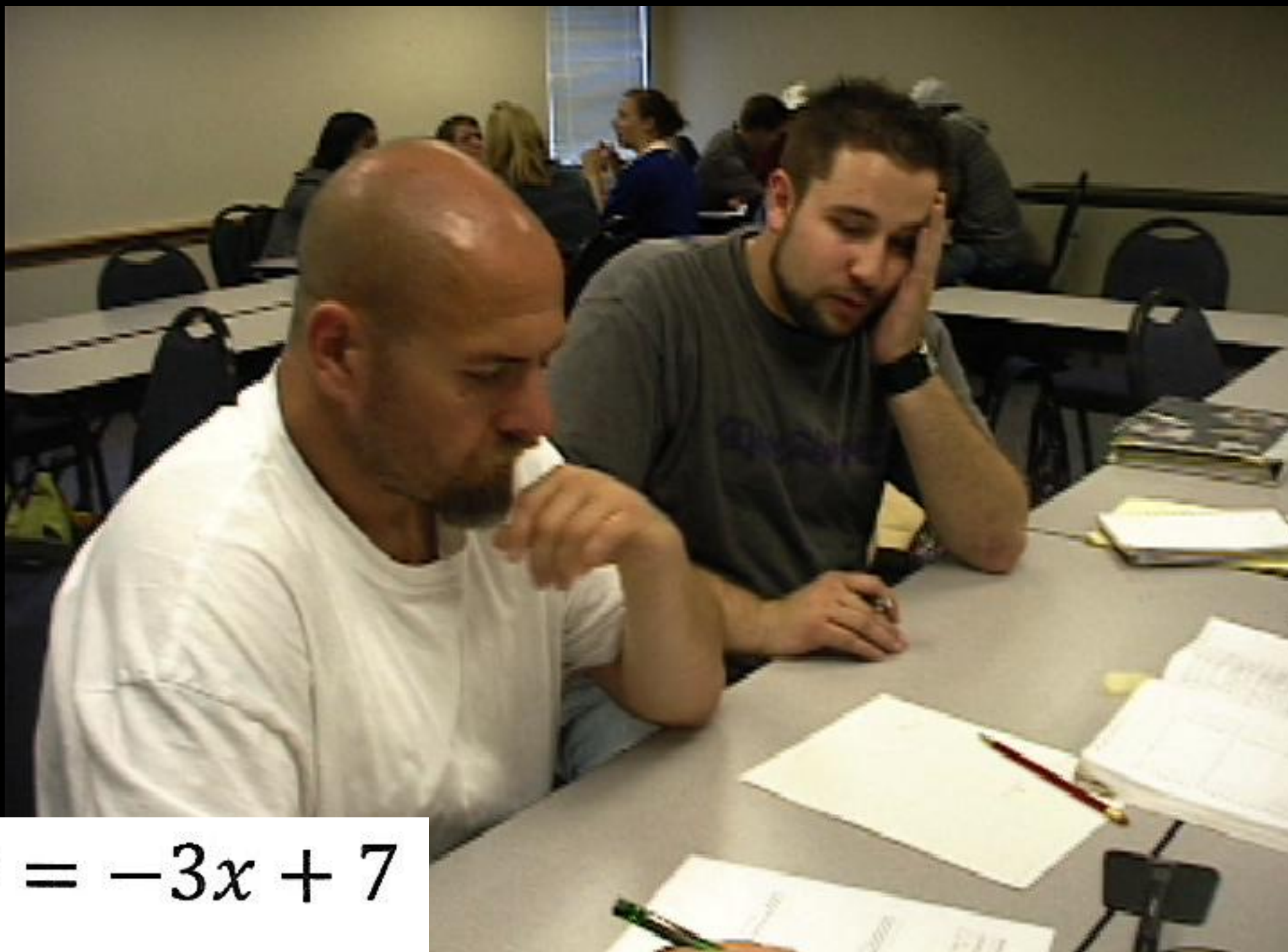
Nate: What is the gap in correlation between $7/3$ and $-5/3$?



Alison: So it's a negative.

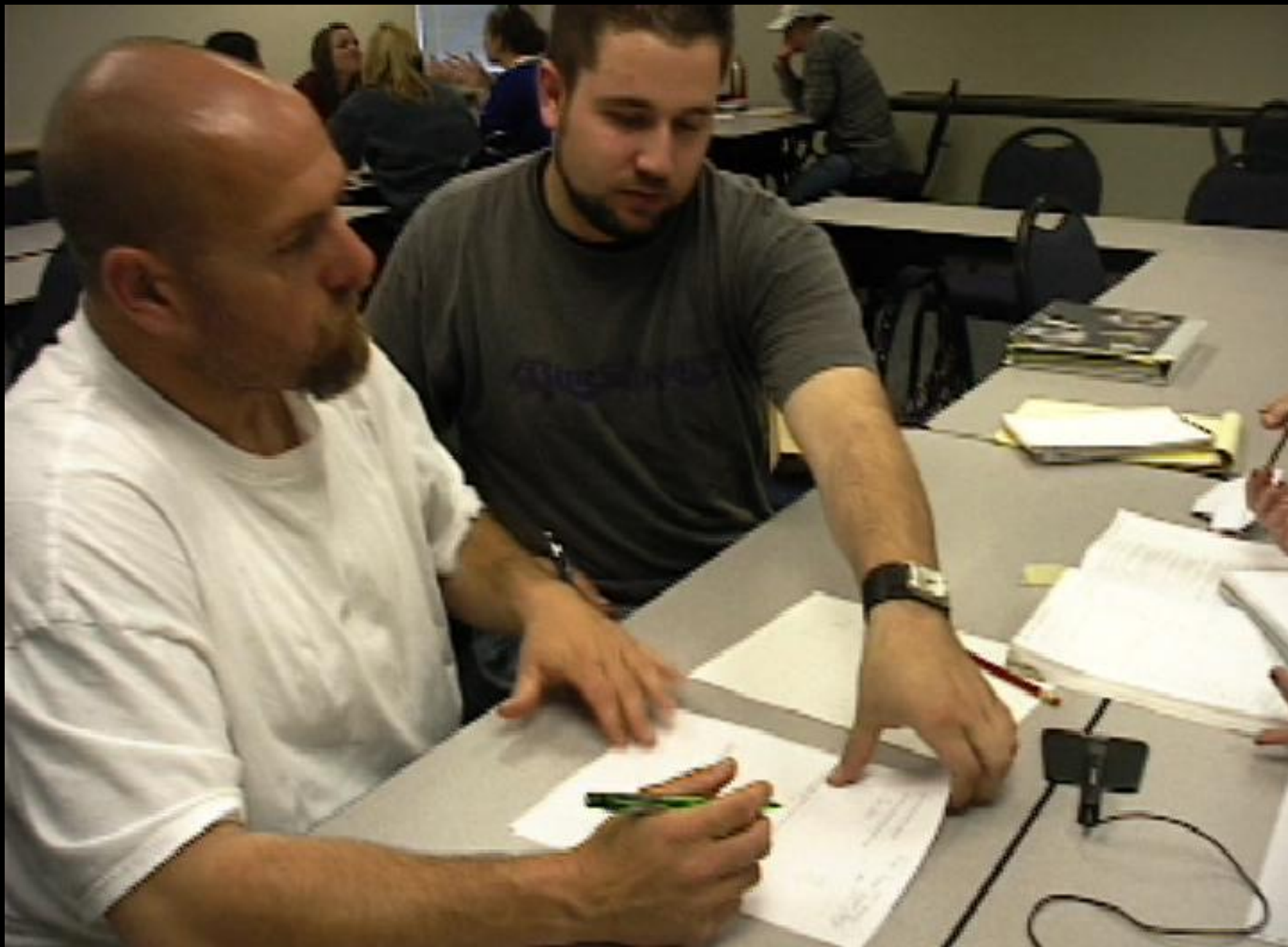
Nate: 13/3?

Alison: No.

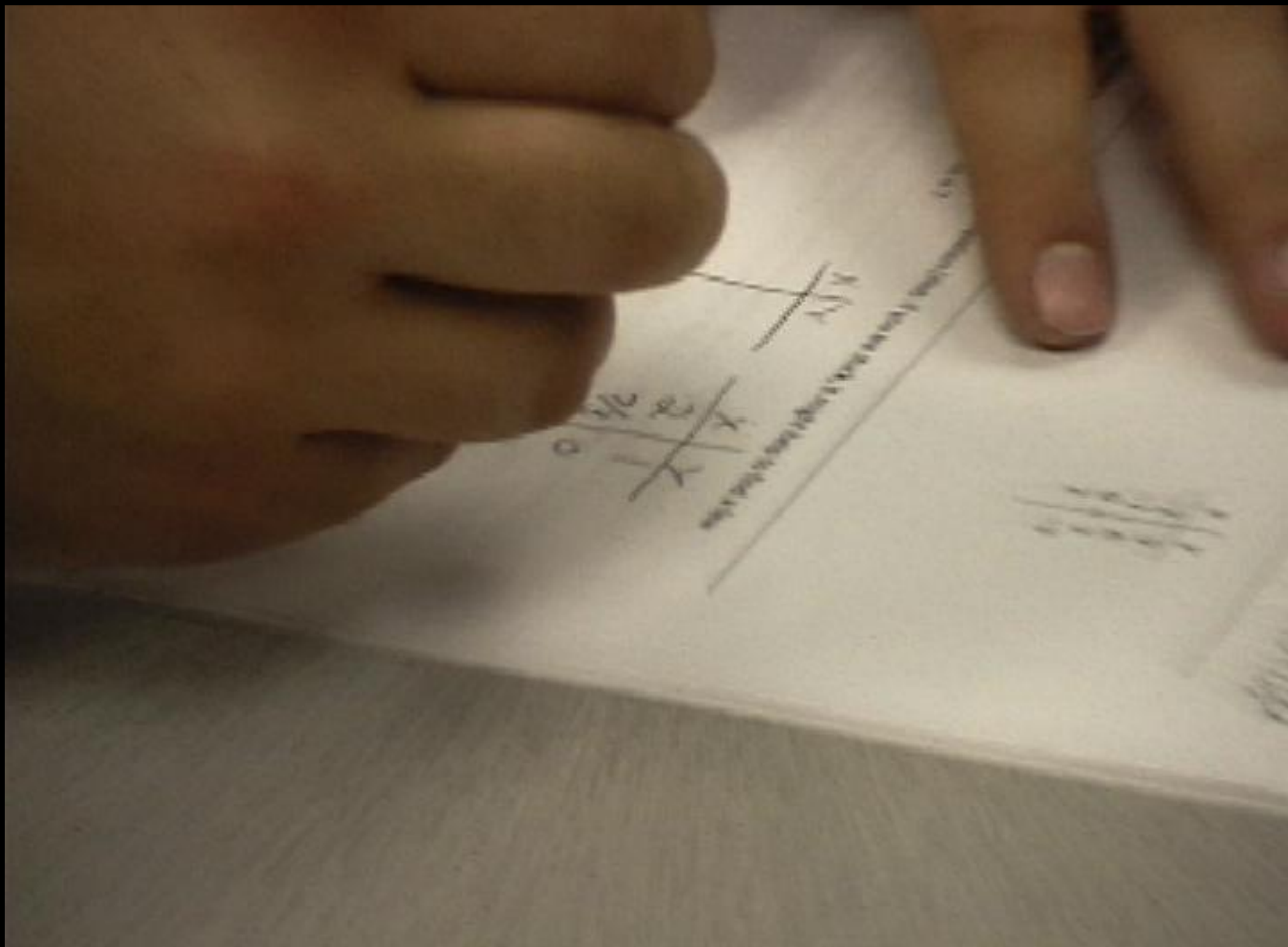


$$y = -3x + 7$$

Nate: So, somebody, real quick, plug in -1 for y .
That way we can go $2, 0, -1$.



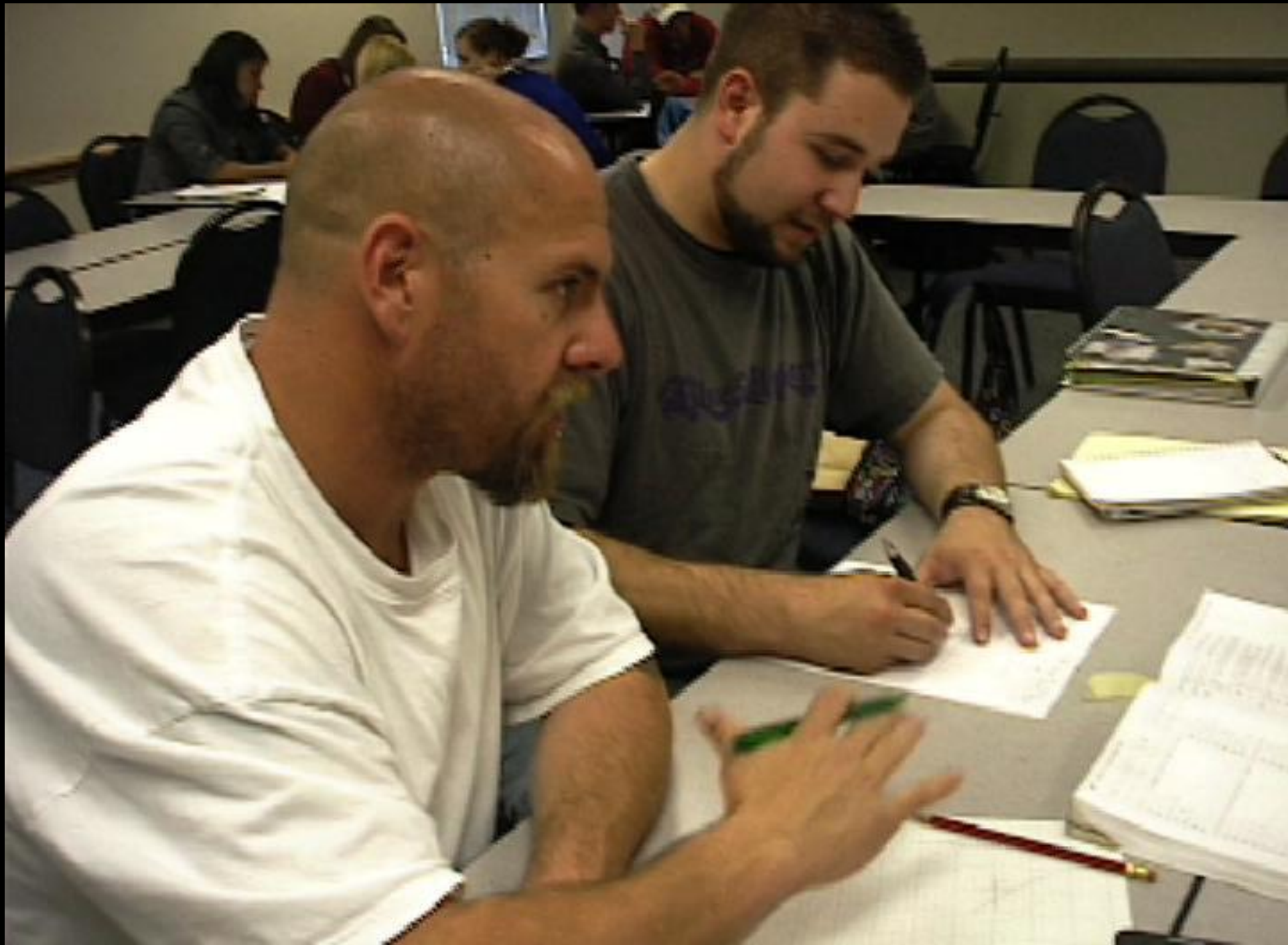
Nate takes over the worksheet.



Alison: What are you doing?

Nate: Just cleaning this up a bit.

Megan: He doesn't like yours. *Mike:* I noticed.

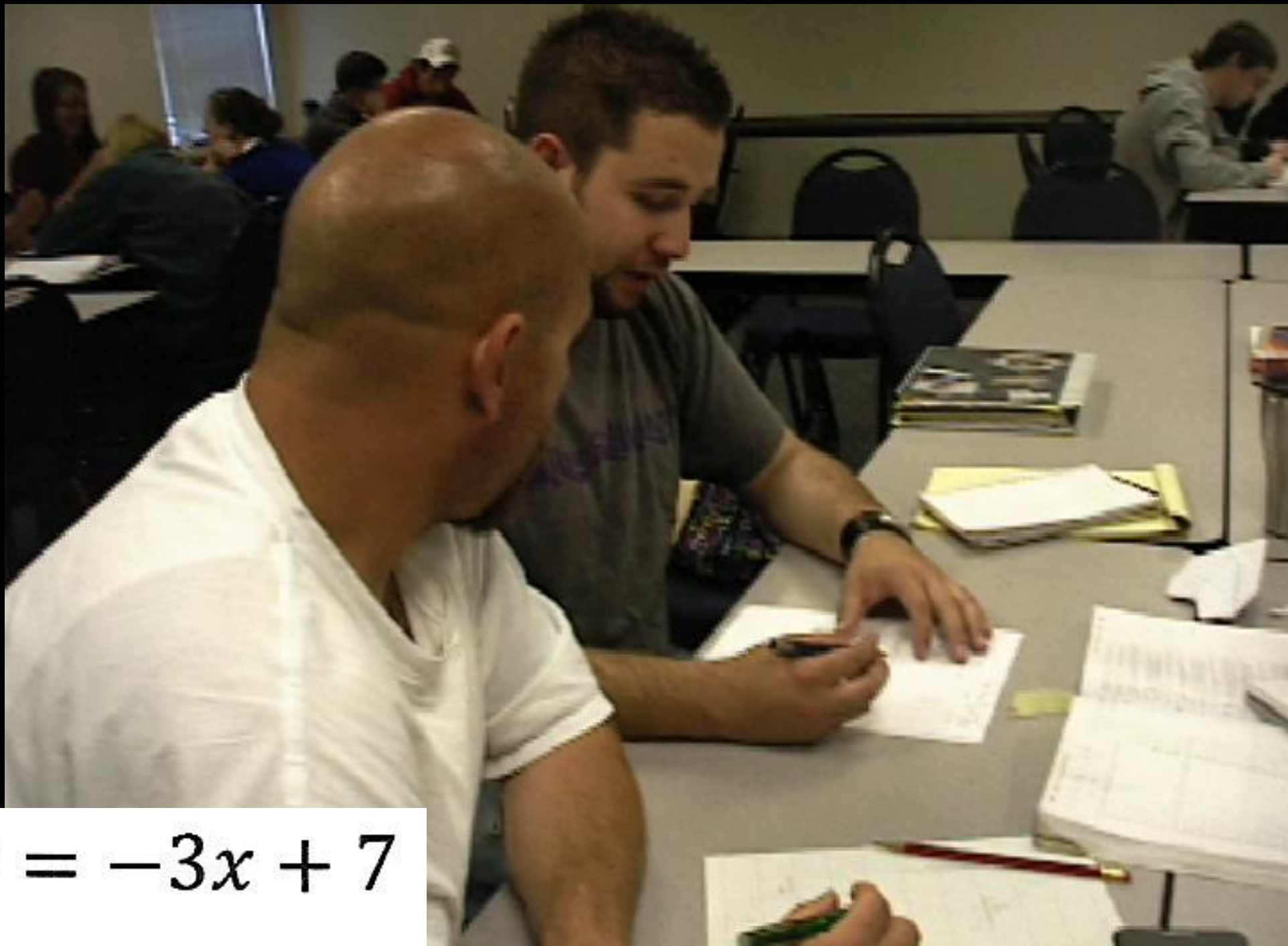


Mike: It makes sense though. We did them out of order. If we do them in order it will be easier to see.



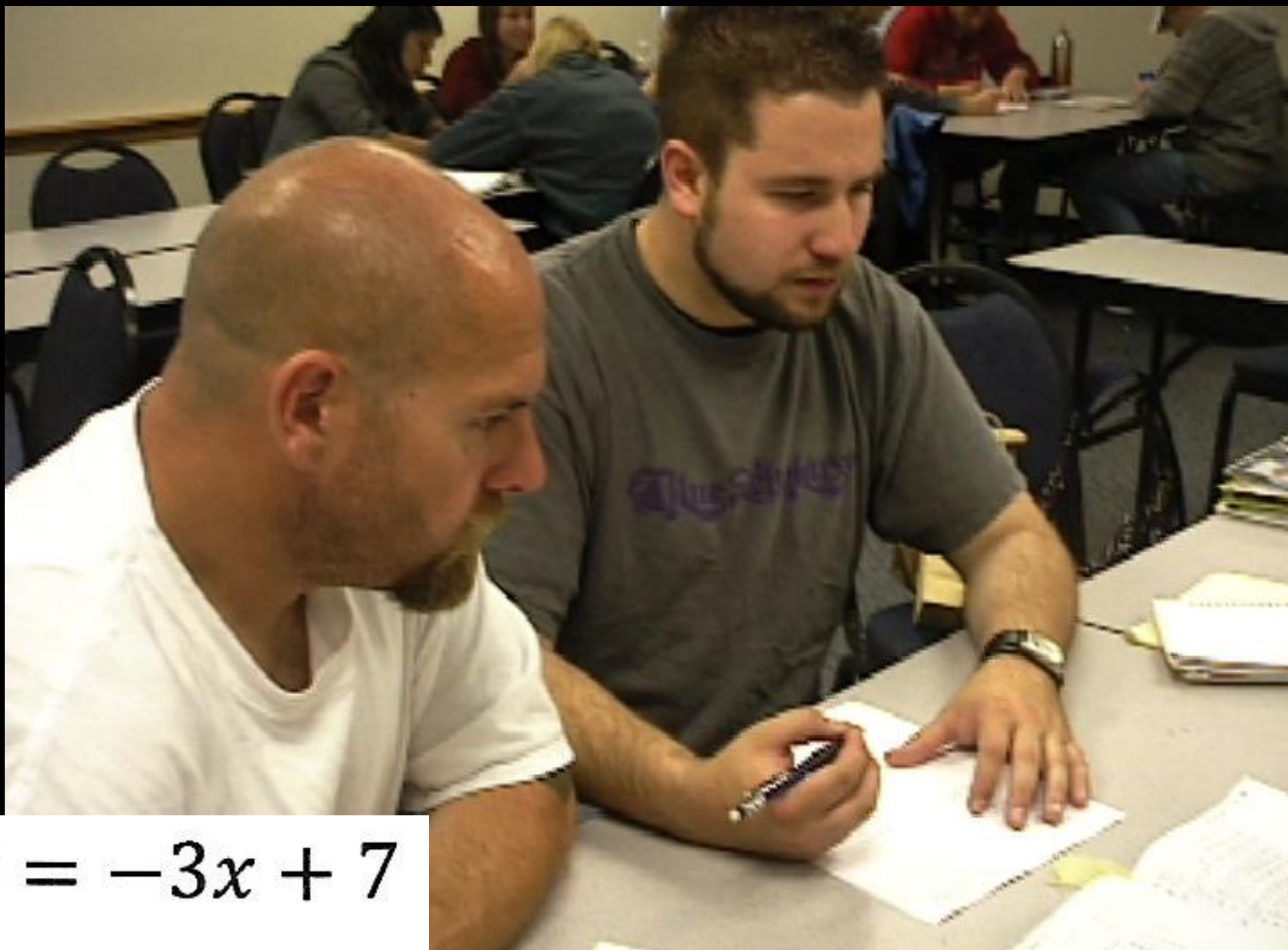
Megan: Are we doing -1 , 0 , 1 , and 2 ?

Nate: Yes.



$$y = -3x + 7$$

Nate: We have 0, 1, and 2. If someone wants to plug in -1 for y , we can solve for that.

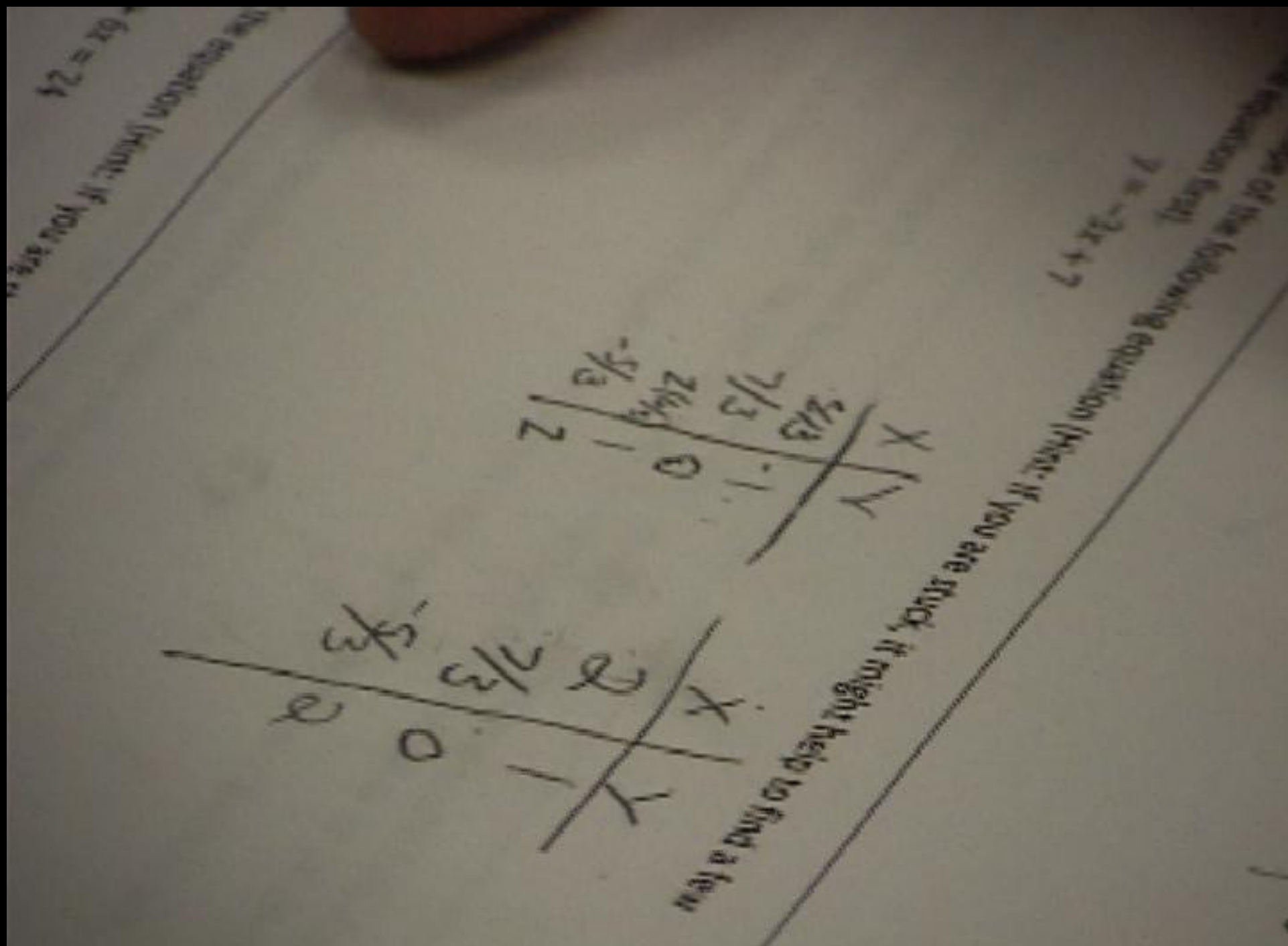


$$y = -3x + 7$$

Megan: $-8/3$.

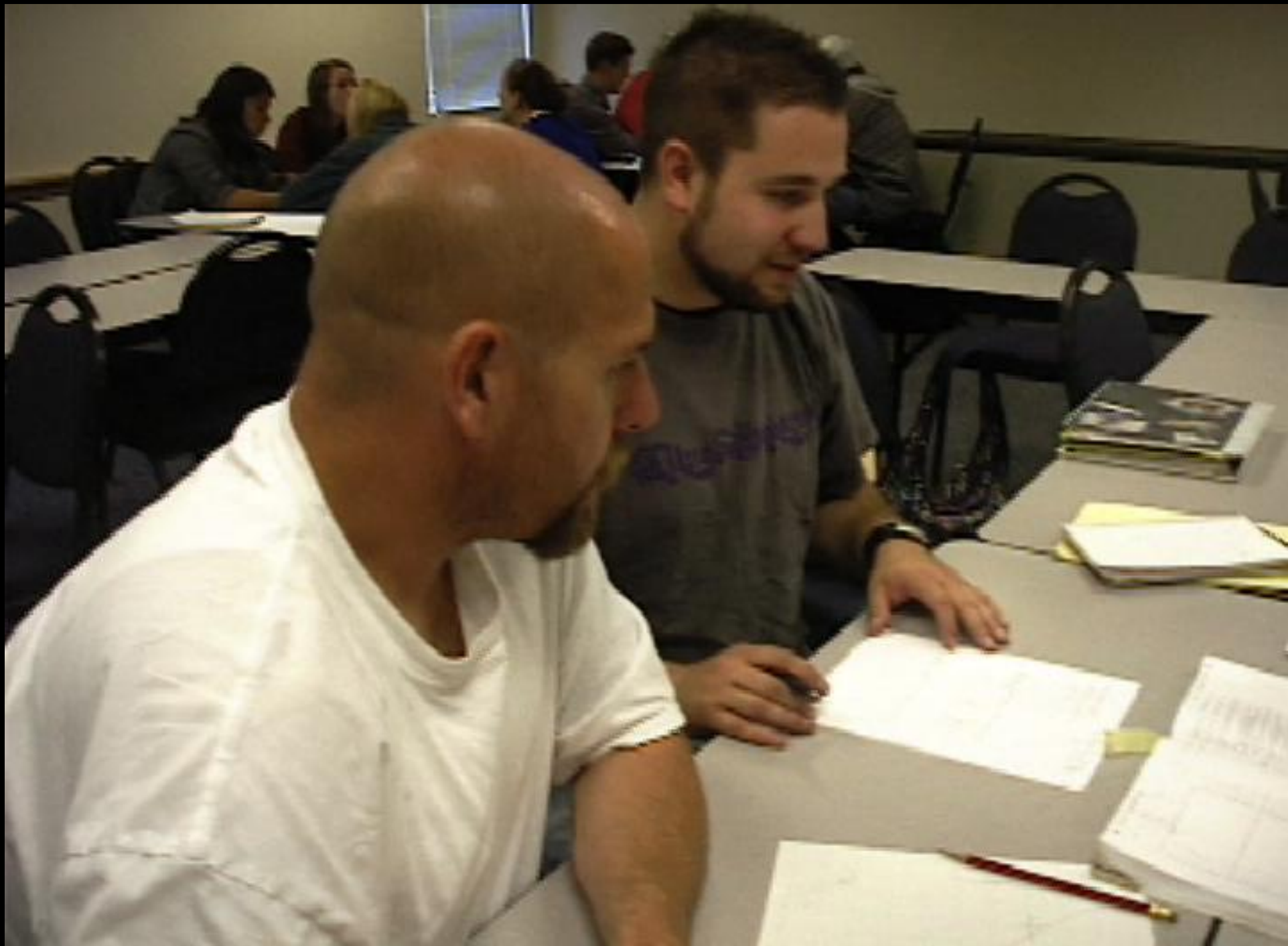
Alison: Yeah.

Nate: Really? $-8/3$, if we are doing -1 ?



Nate: So that's a jump of $-1/3$, $-1/3$...

Mike: Then $13/3$?



Nate: OK. Who did the math on plugging in 2 for y ?



Megan: We did.

Nate: You want to check that real quick?



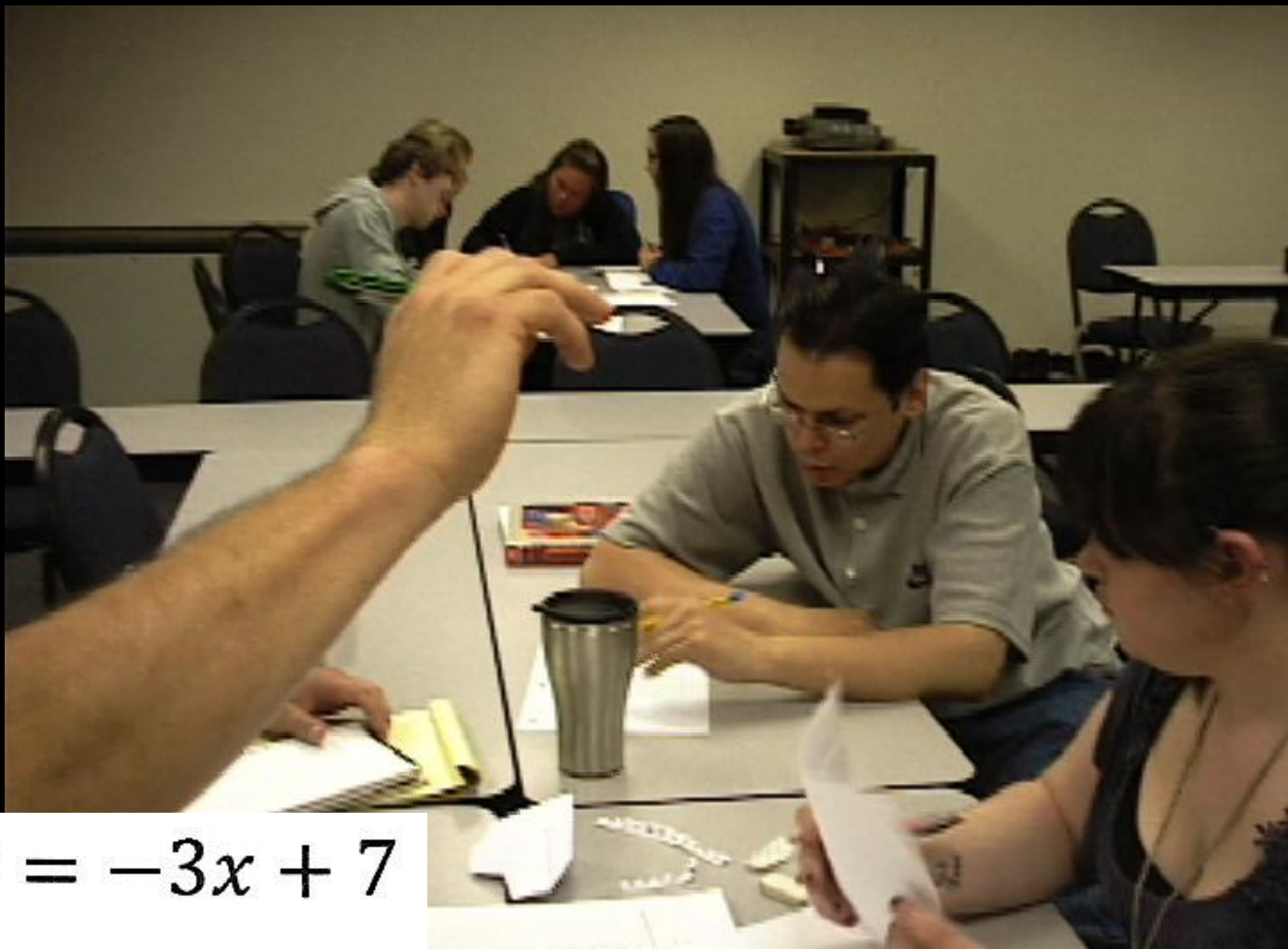
$$y = -3x + 7$$

Phil: When $y = 2$, $x = -5/3$.

Megan: Phil did the same thing. It's $-5/3$.



Alison: Hey, Mike?



$$y = -3x + 7$$

Nate: This is making sense. We go $-8/3$, $-7/3$, $-6/3$ and $-5/3$.

Phil: Before you get -1 you get -2 .

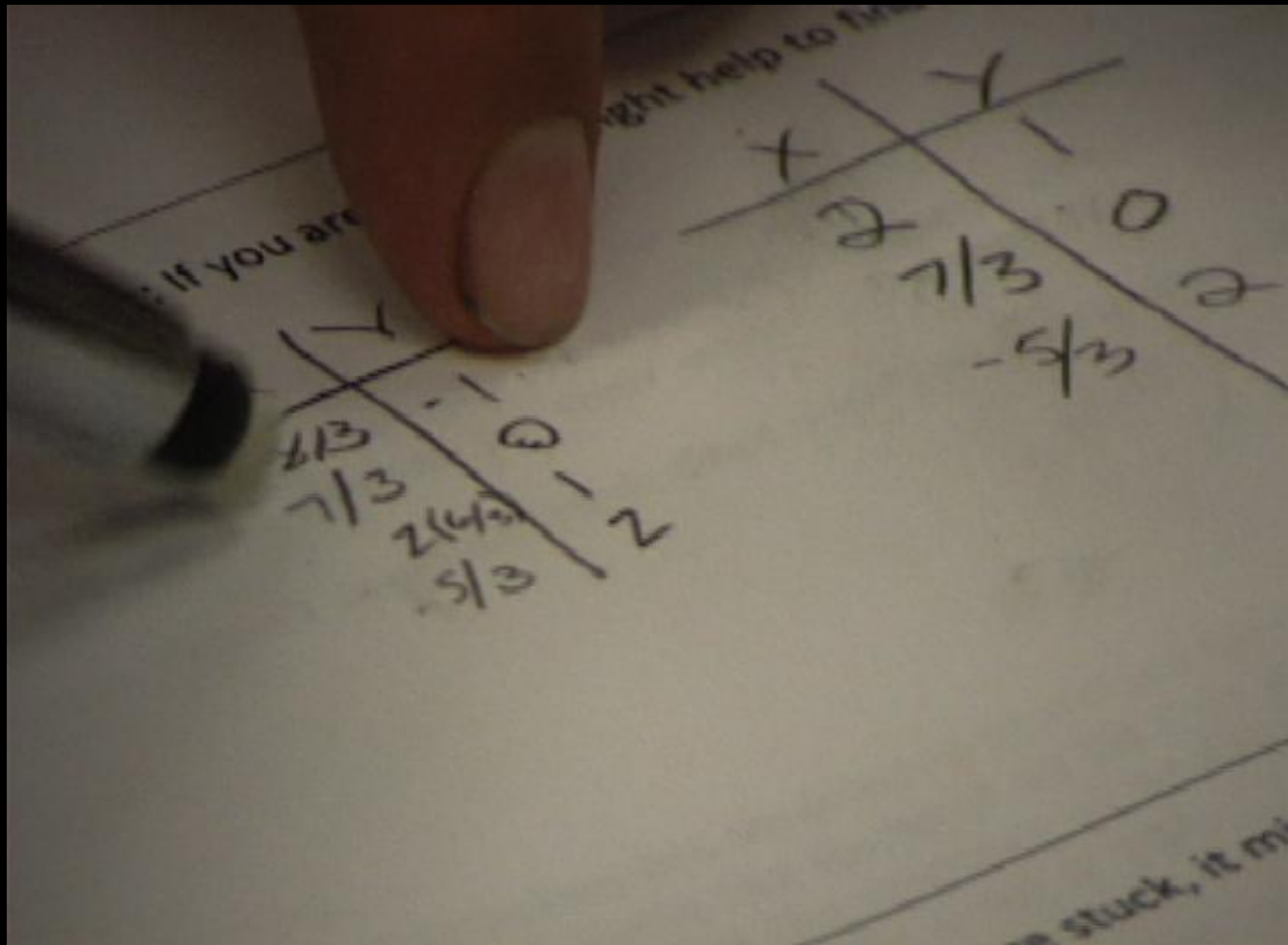


Long pause.



$$y = -3x + 7$$

Nate: Guys, I do believe the solution for $y = 2$, can't be negative. So it should be $+5/3$. There we go.

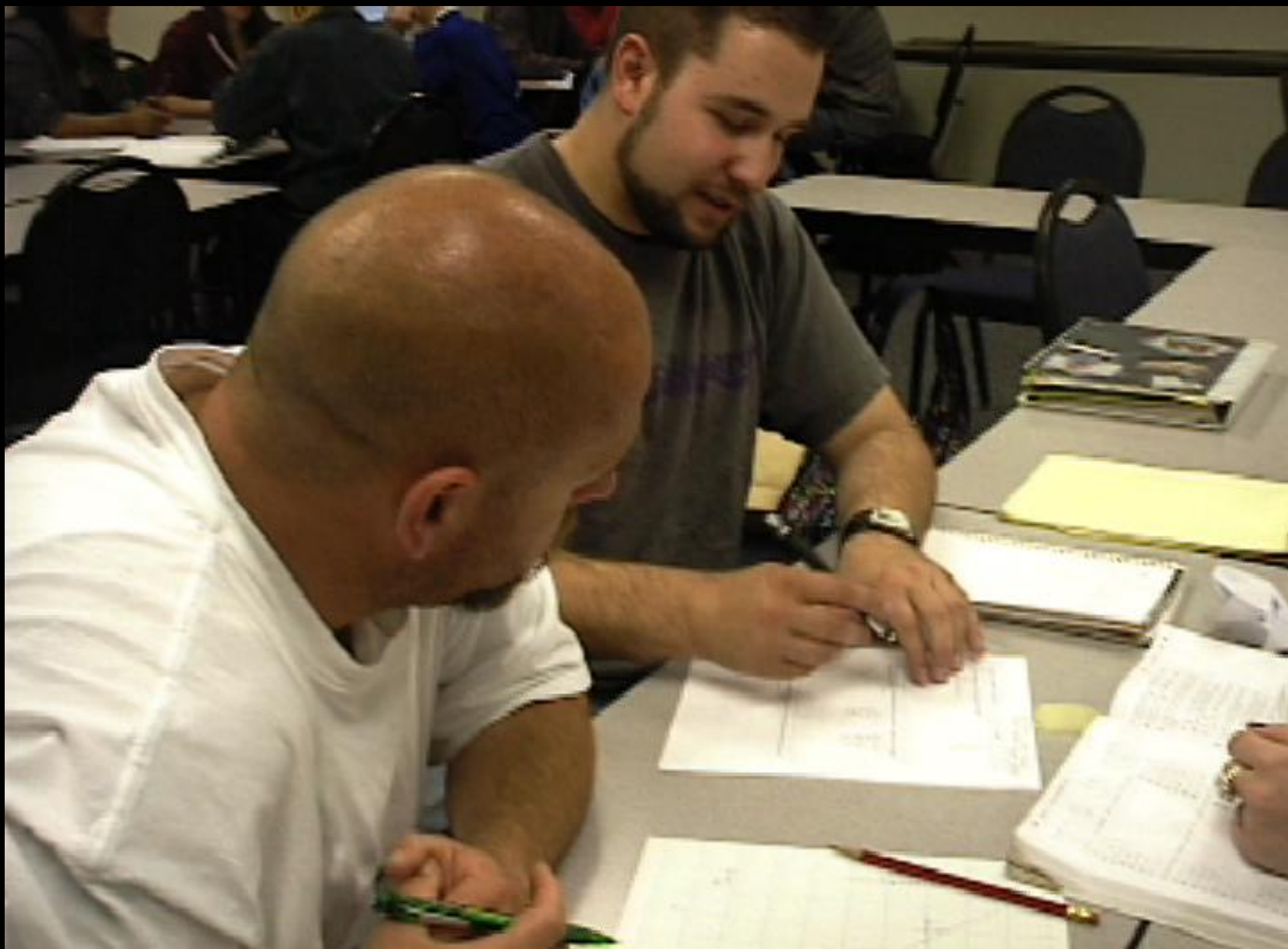


Nate: Look. Minus $\frac{1}{3}$. Minus $\frac{1}{3}$. Minus $\frac{1}{3}$. Minus $\frac{1}{3}$.



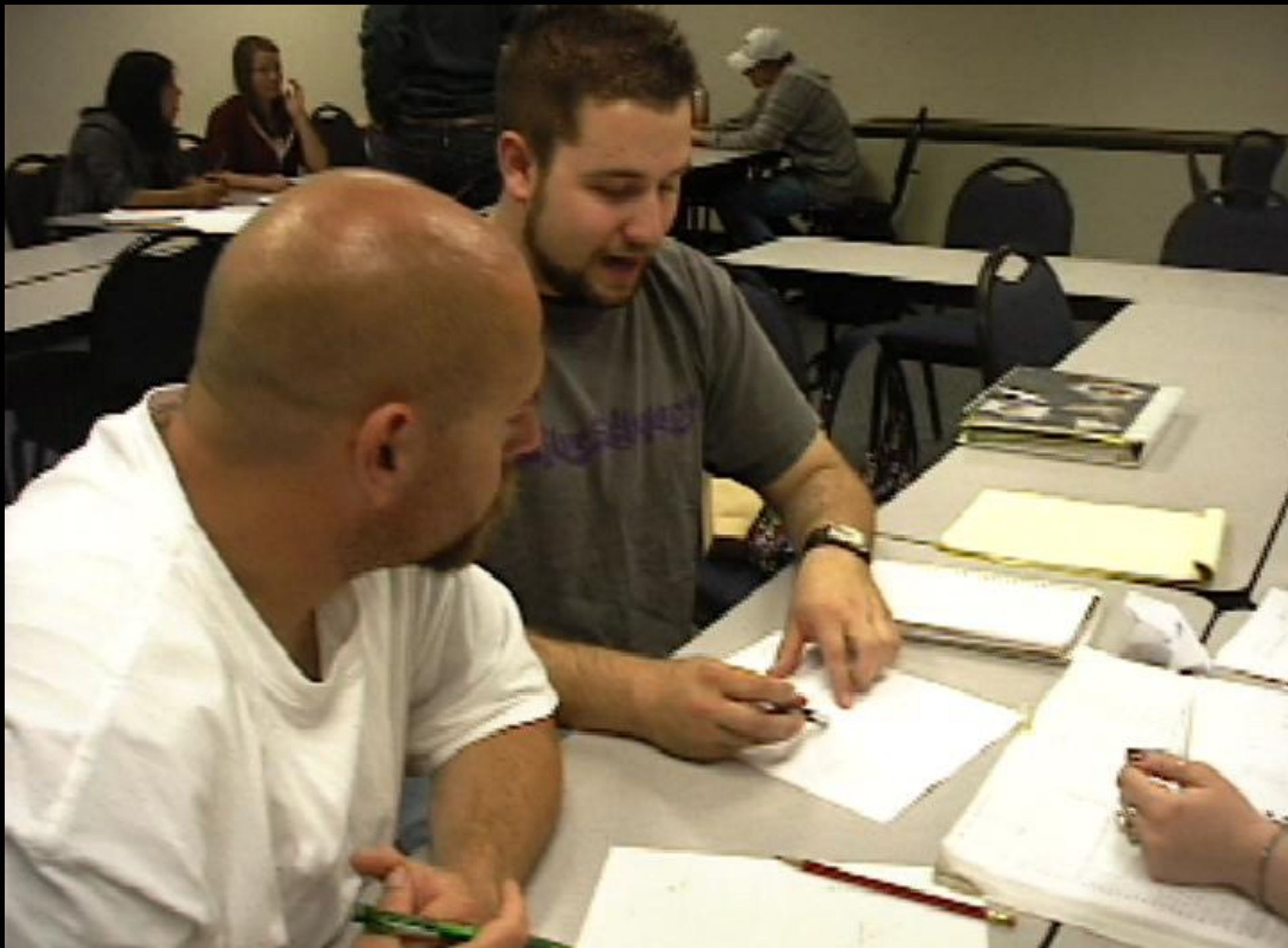
Megan: So the slope is $\frac{1}{3}$.

Nate: One to one-third. No. Negative one-third.

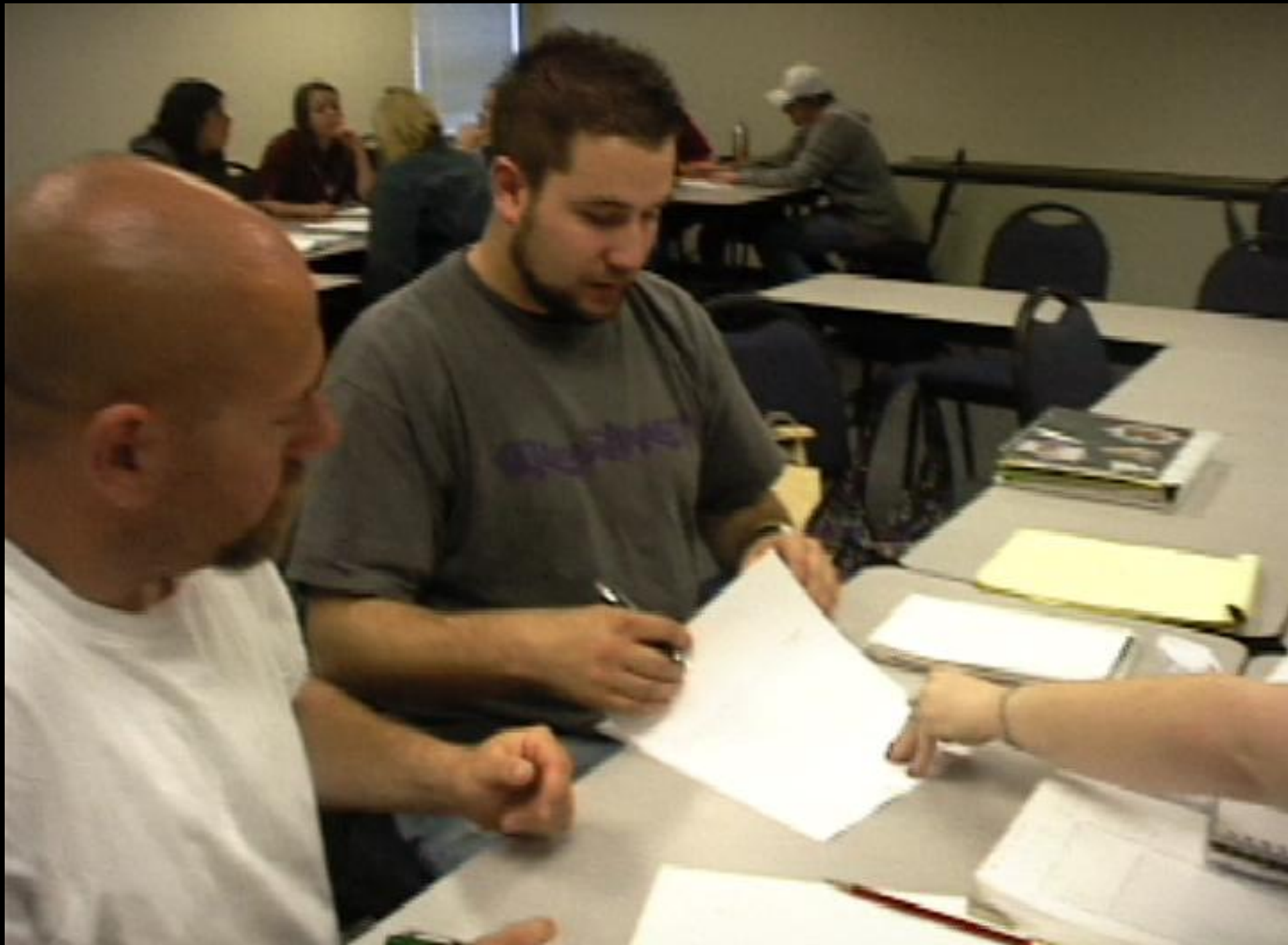


Mike: No, because X always comes first.

Nate: Good call. Negative one-third to one.



Nate: For every one we go up here, we are going down $-1/3$ here.

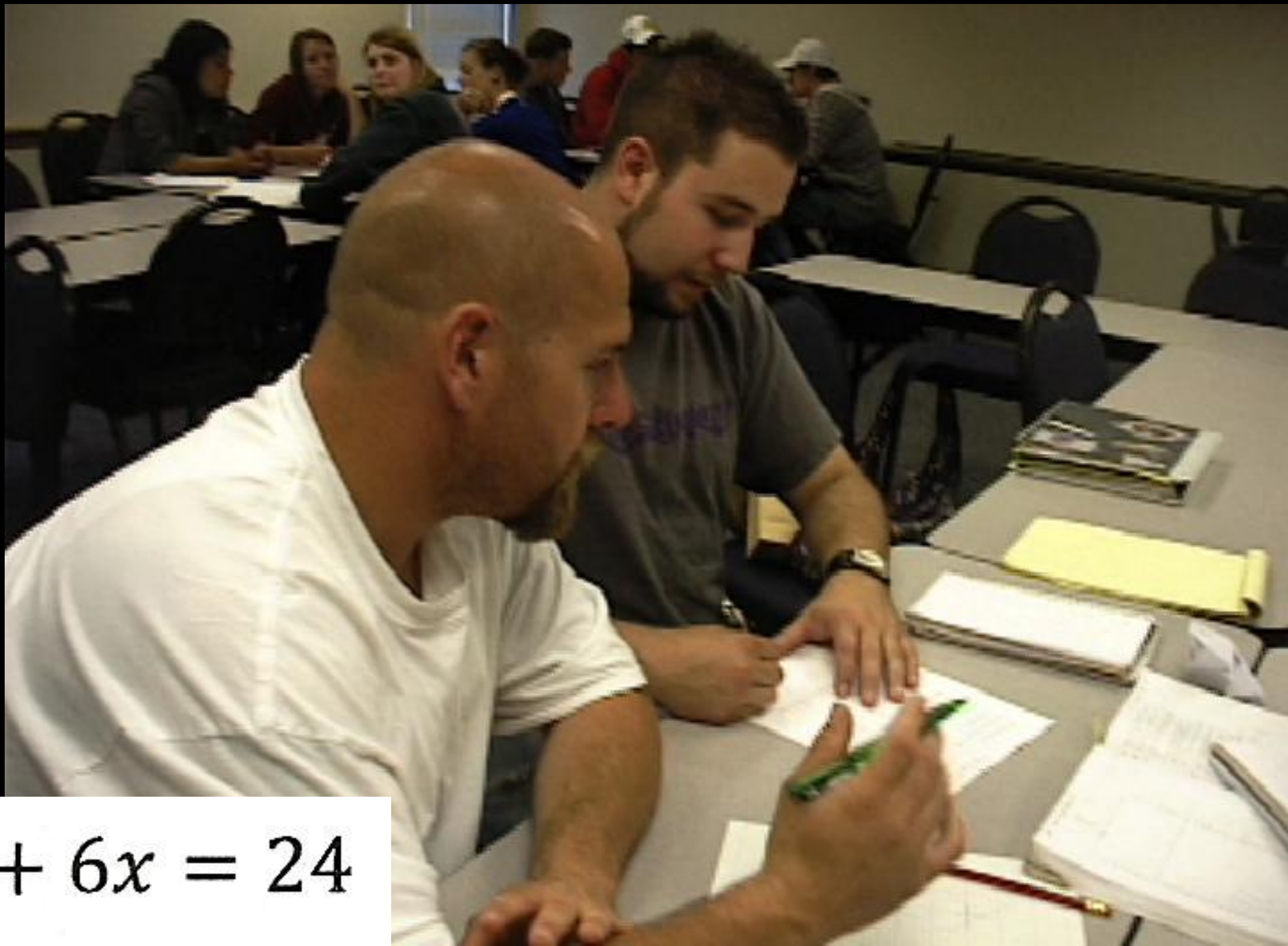


Mike: How many questions are on here?

Alison: There is this one, another one and a long one on the back.

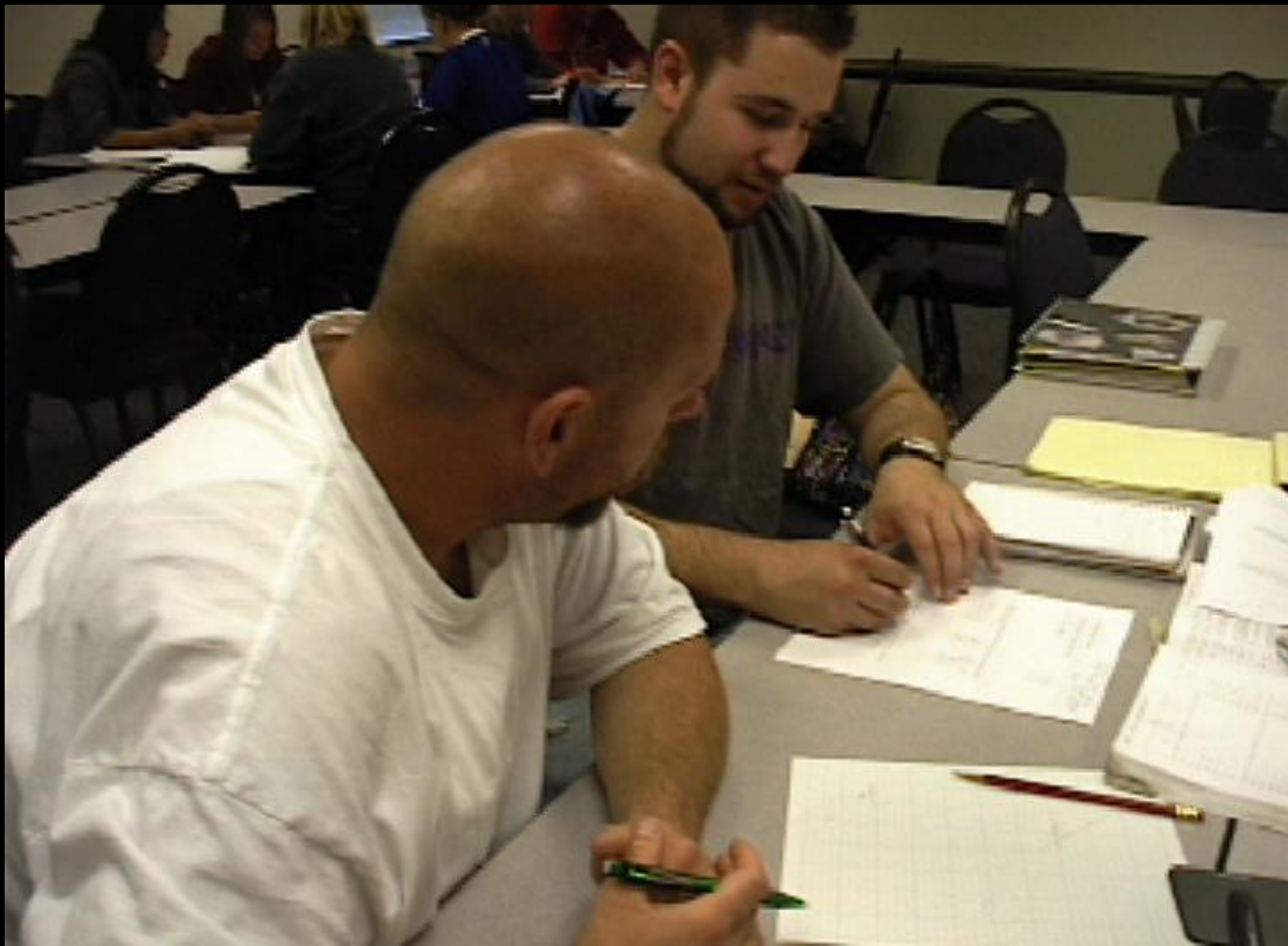


Nate reads the problem: “Describe the slope of this equation.” $3y + 6x = 24$



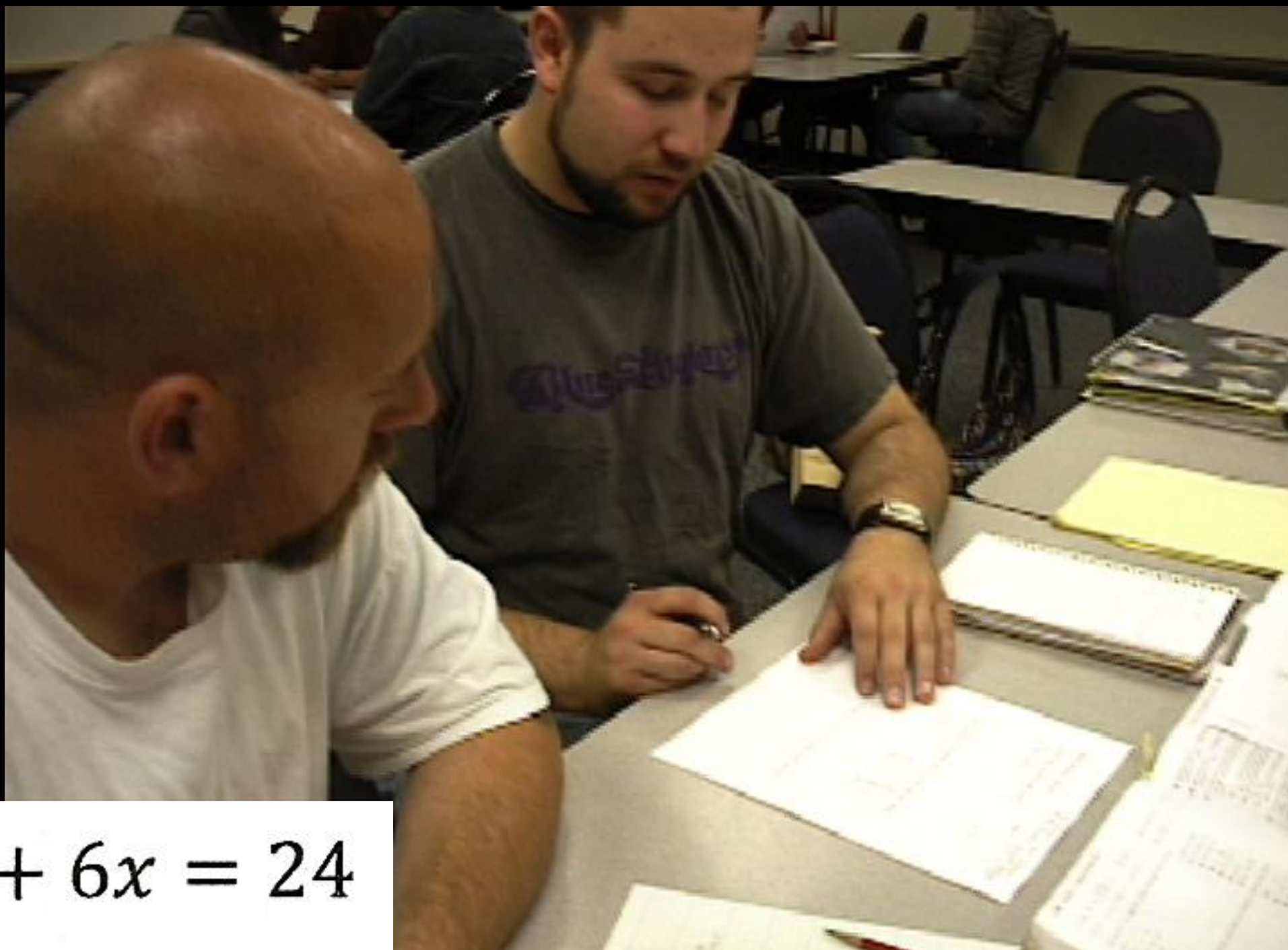
$$3y + 6x = 24$$

Mike: Let's go with the easy ones first on this. I think we over-complicated that last one. Let's plug in zero for both sides.



Megan: Go for it.

Nate: Start with the intercepts first, we could say.

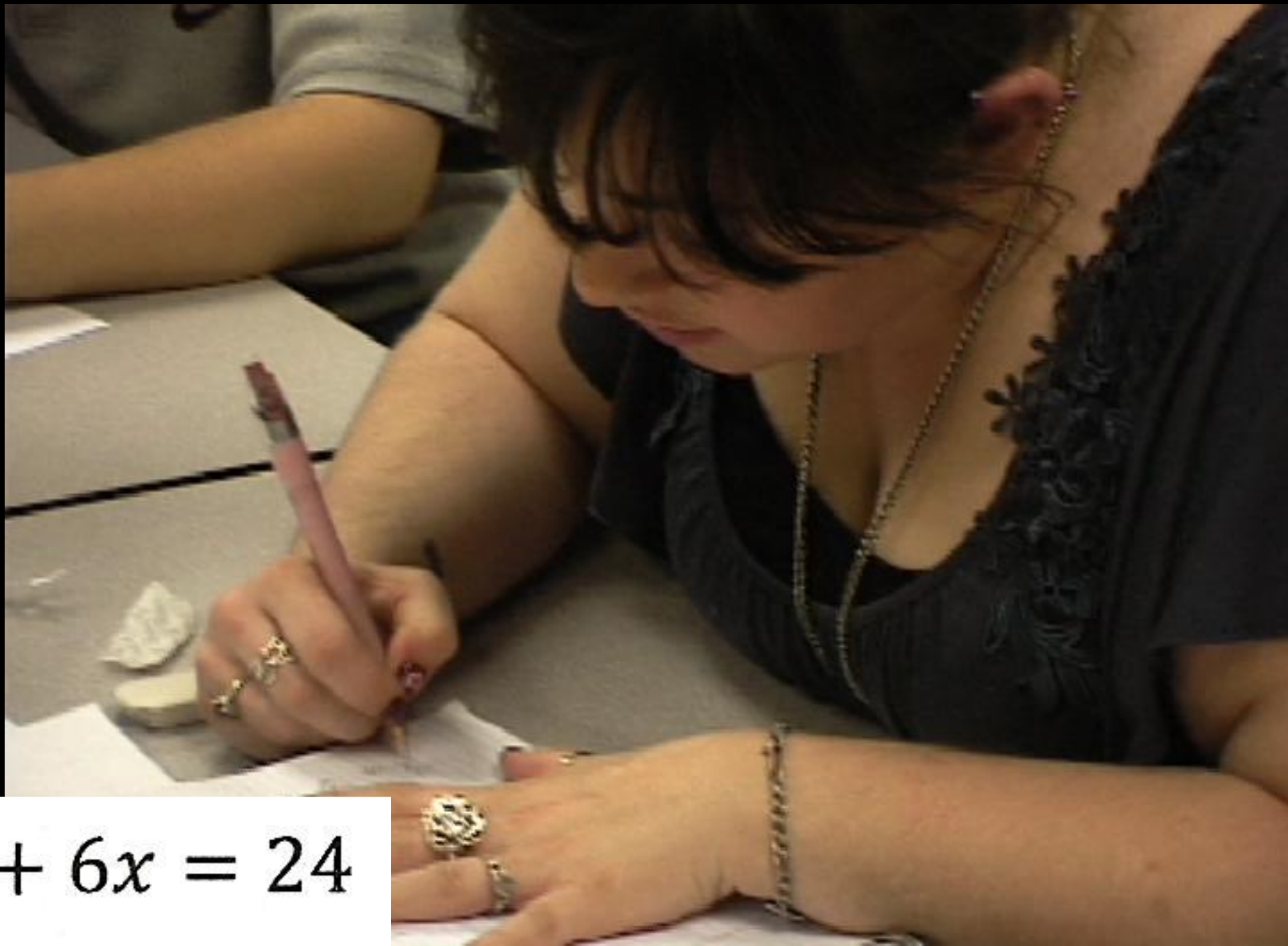


$$3y + 6x = 24$$

Nate: So 6 just goes away. $3y = 24$.

Mike: 8.

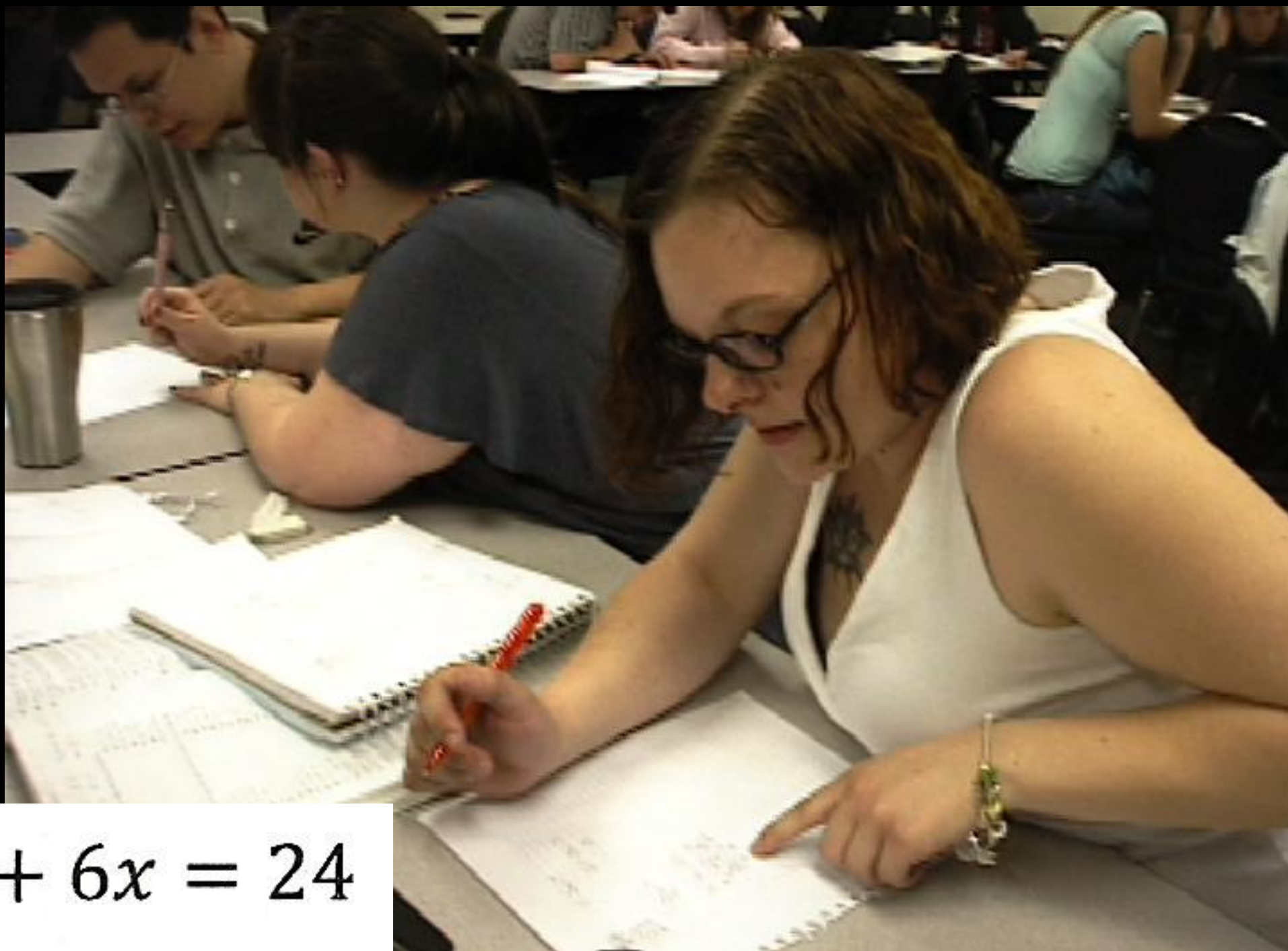
Megan: So at 0 it is 8.



$$3y + 6x = 24$$

Nate: We could make this even easier. Plug in 1 and we have $3 + 6x = 24$. $6x$ is going to have to be 21.

Mike: Right.



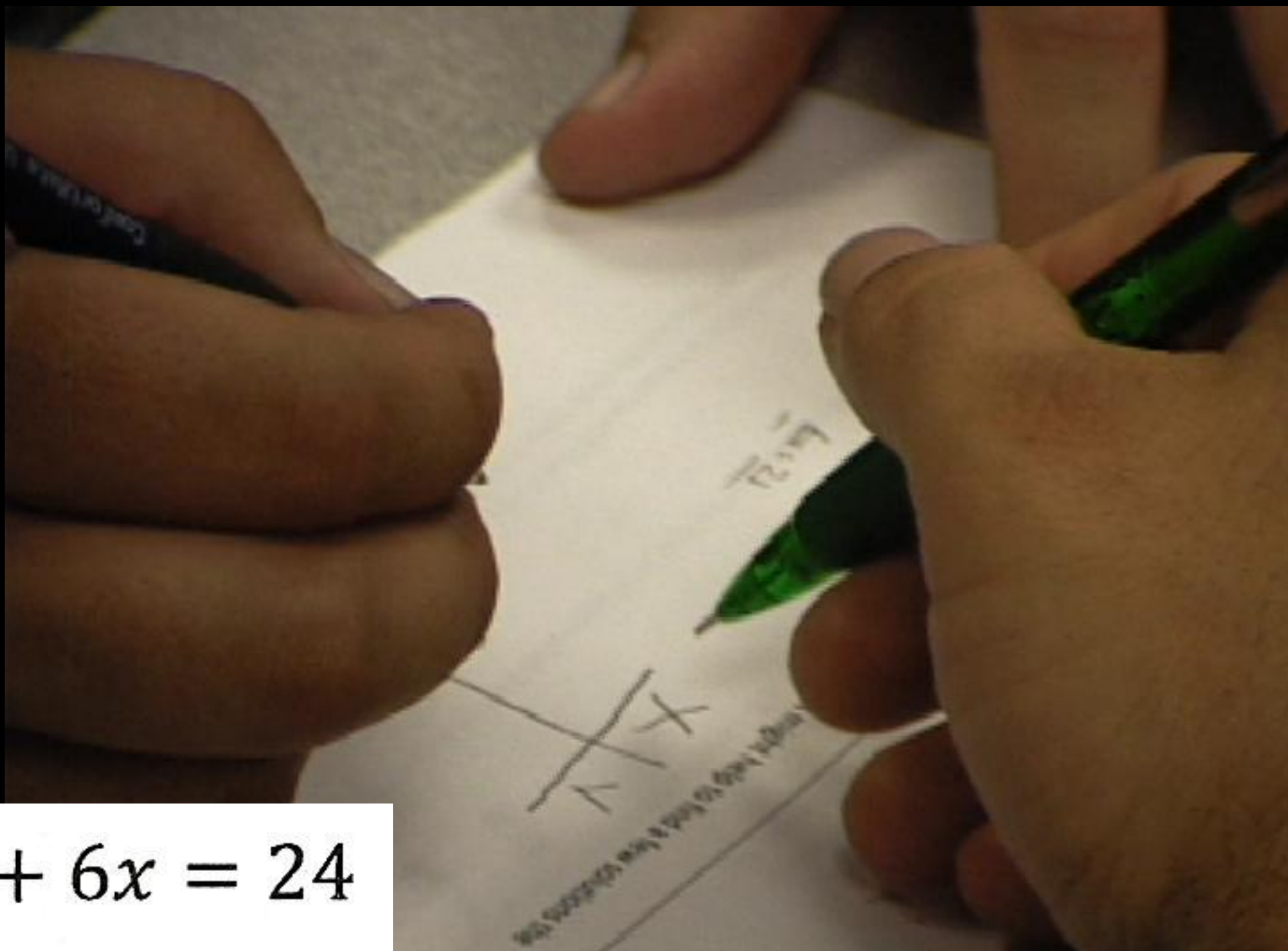
$$3y + 6x = 24$$

Alison: But 6 doesn't go into 21.



$$3y + 6x = 24$$

Megan: Wait. It would be $3y = 18$. Divide by 3.
1 would be 6.

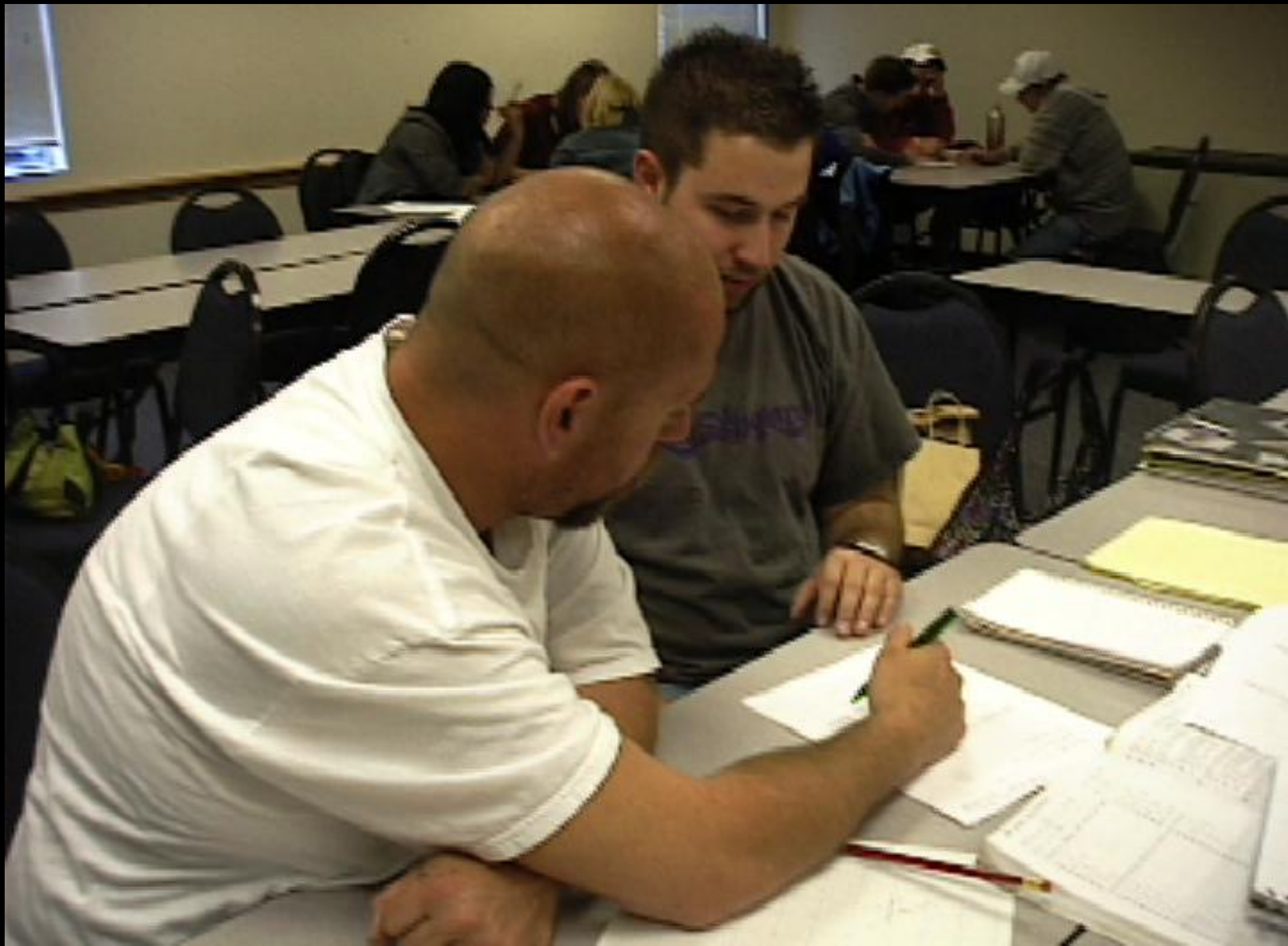


$$3y + 6x = 24$$

Nate: 1 would be 6?

Mike: 6 x 3 is 18.

Megan: 24 – 6 is 18.



Mike: If you go to zero here, we are going to see some kind of correlation.

Megan: We are sticking with X first, so stick with X.

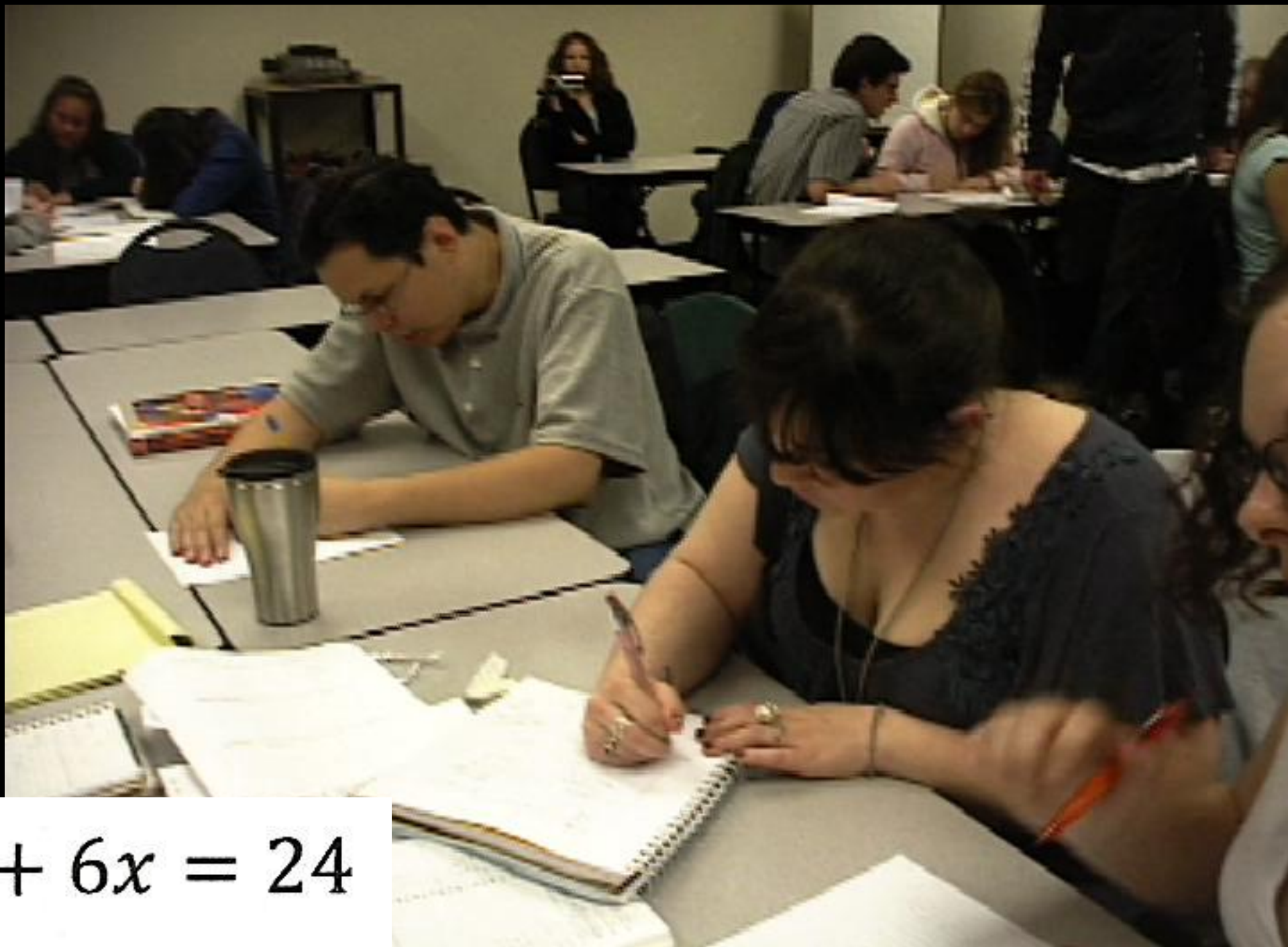


$$3y + 6x = 24$$

Megan: 1 is 6, -1, -2.

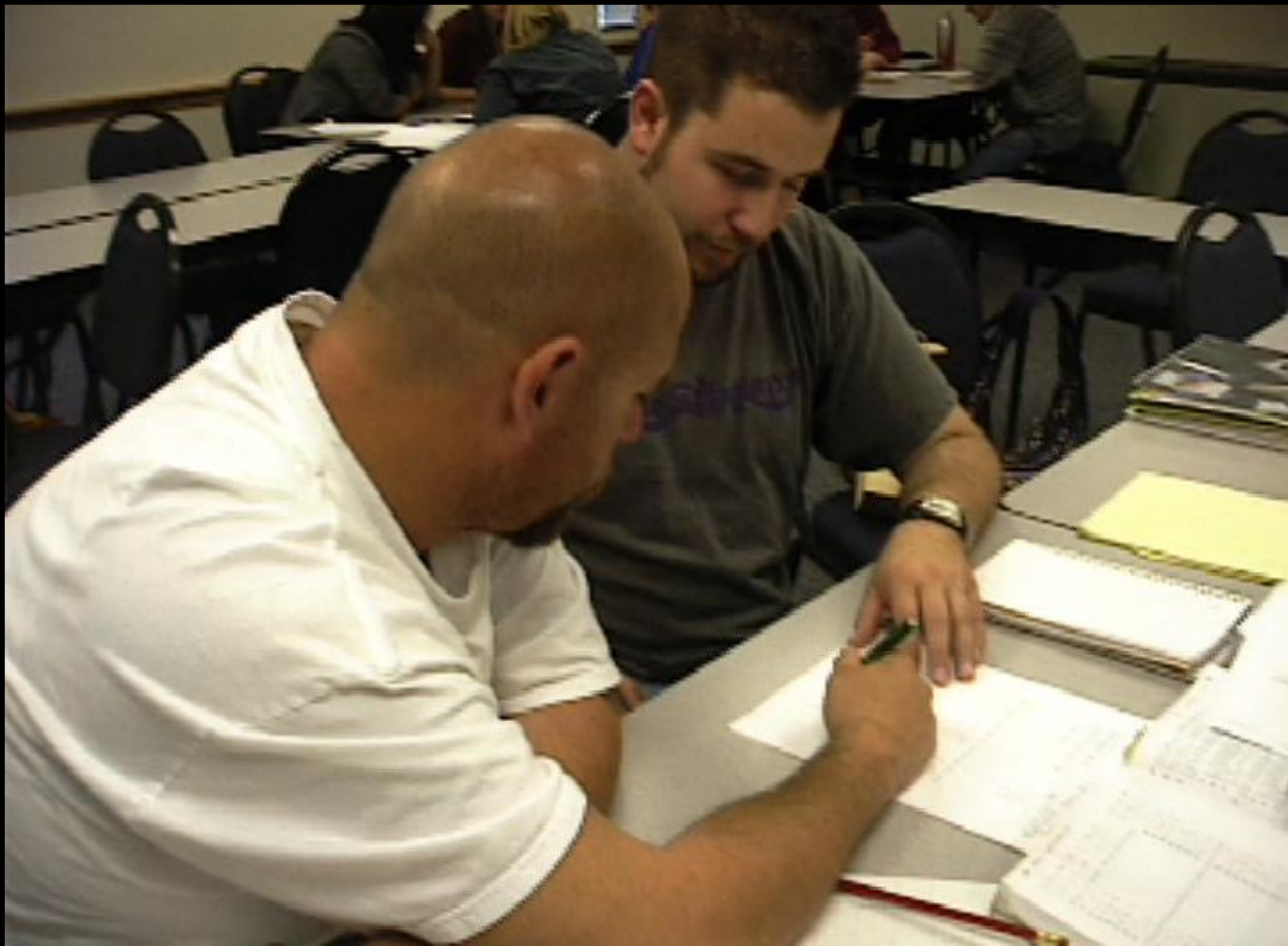
Alison: I have what it is if you plug 2 in for X.

Nate: What do you have? *Alison:* 2 for X, 4 for Y.



$$3y + 6x = 24$$

Megan: I am doing -1 right now.
 -1 will be 10.



Mike: So these go by 2's.

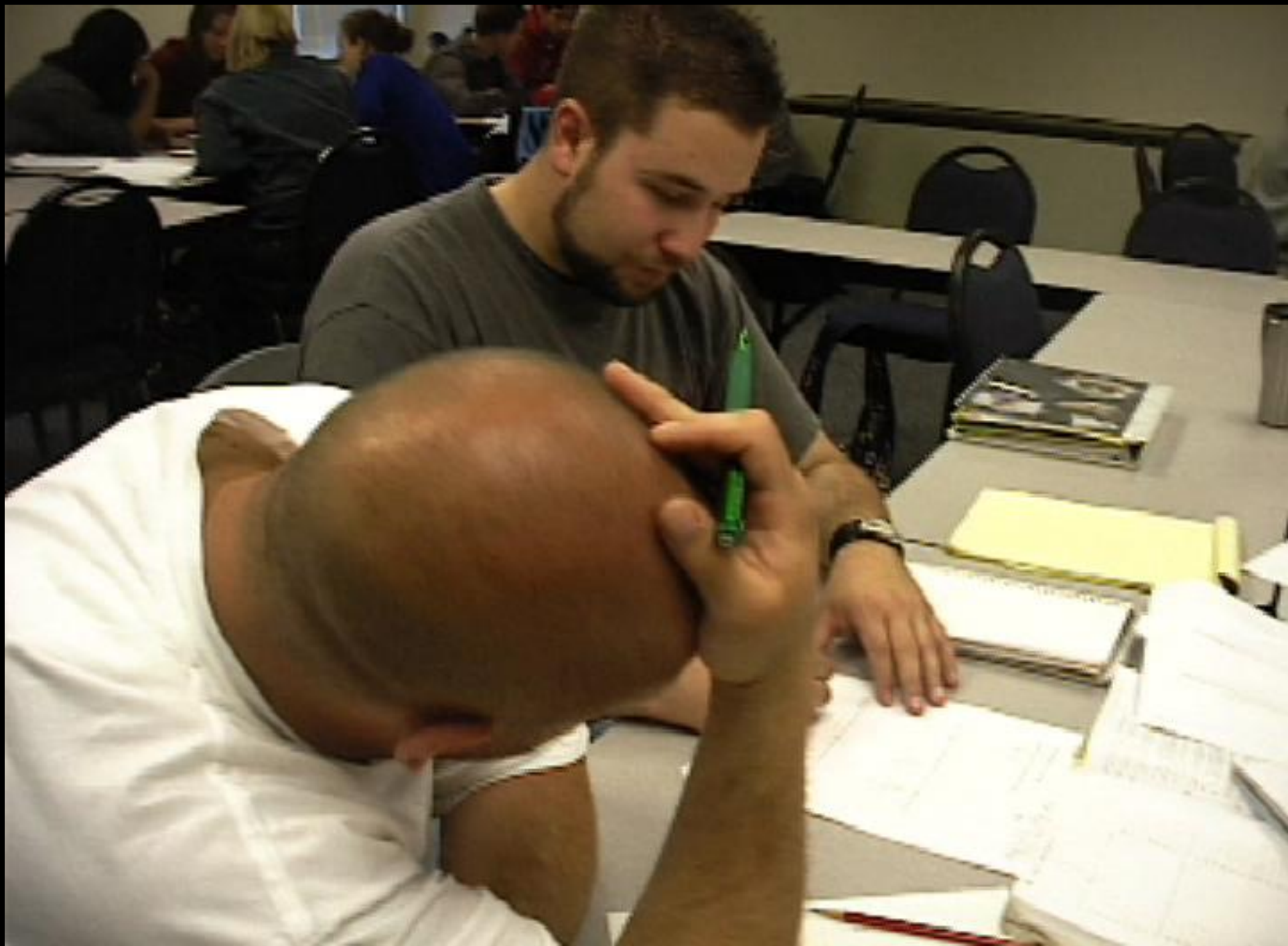


Alison: That goes in the pattern. It goes 4, 6, 8, so 10 would work. It goes by 2's.



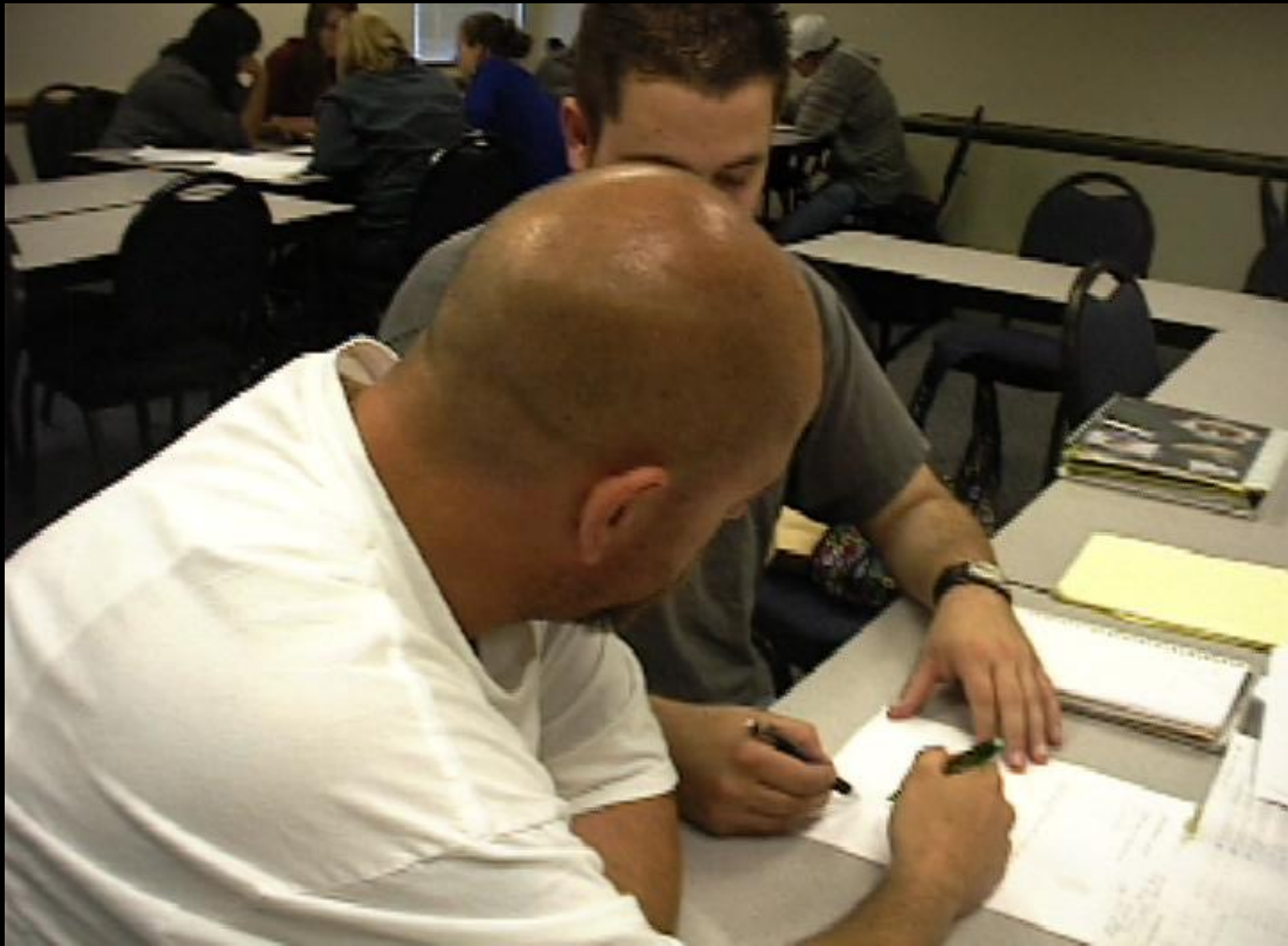
$$3y + 6x = 24$$

Megan: -2 would be 12.



Mike: It goes by 2's.

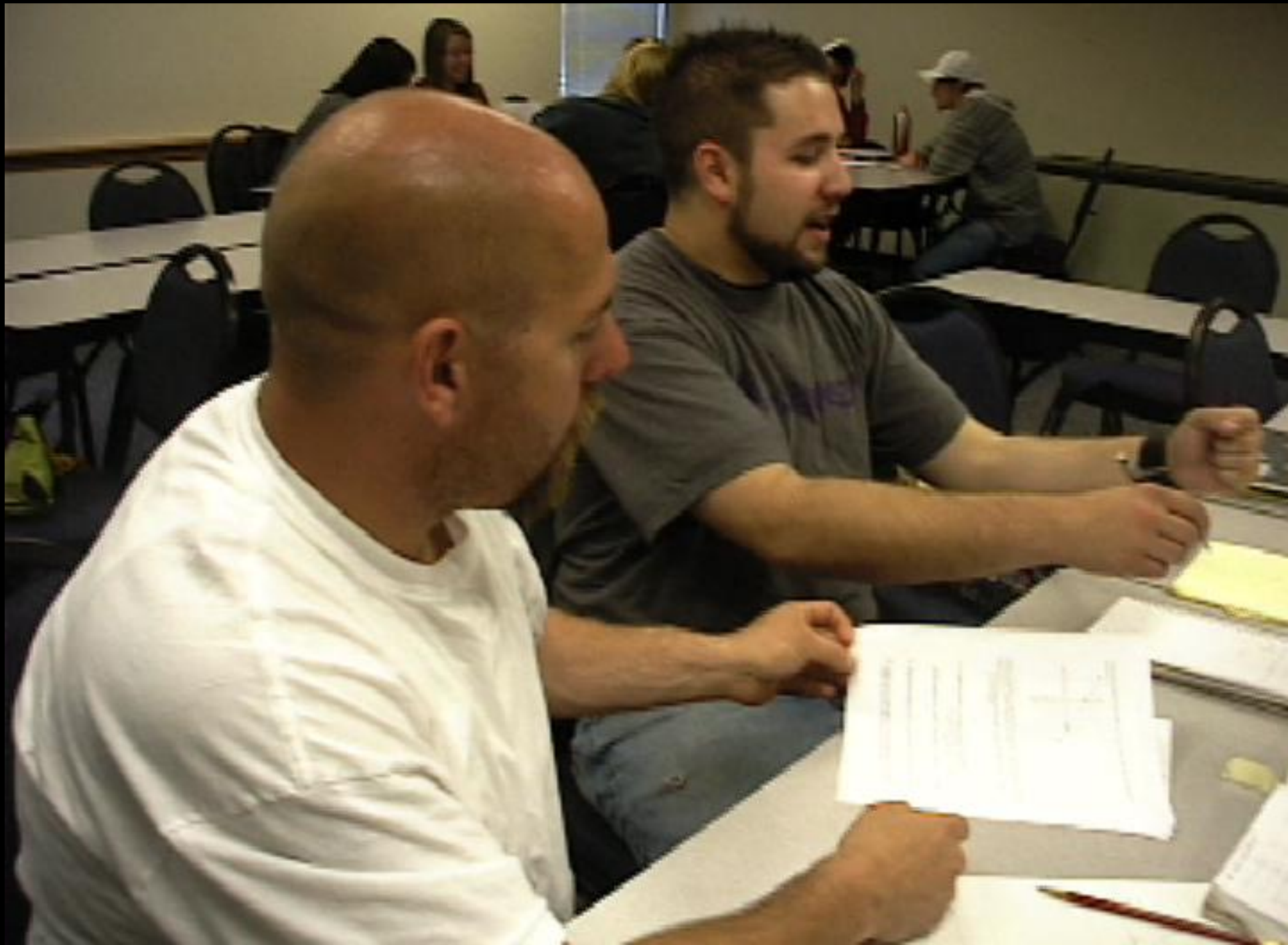
Nate: We've got it guys. 1 to -2.



Mike: No. *Nate:* Yes, because these numbers are getting smaller. *Mike:* Yeah. You're right. You notice how he calls this exercise "Slope FUN!" *(laughter)*



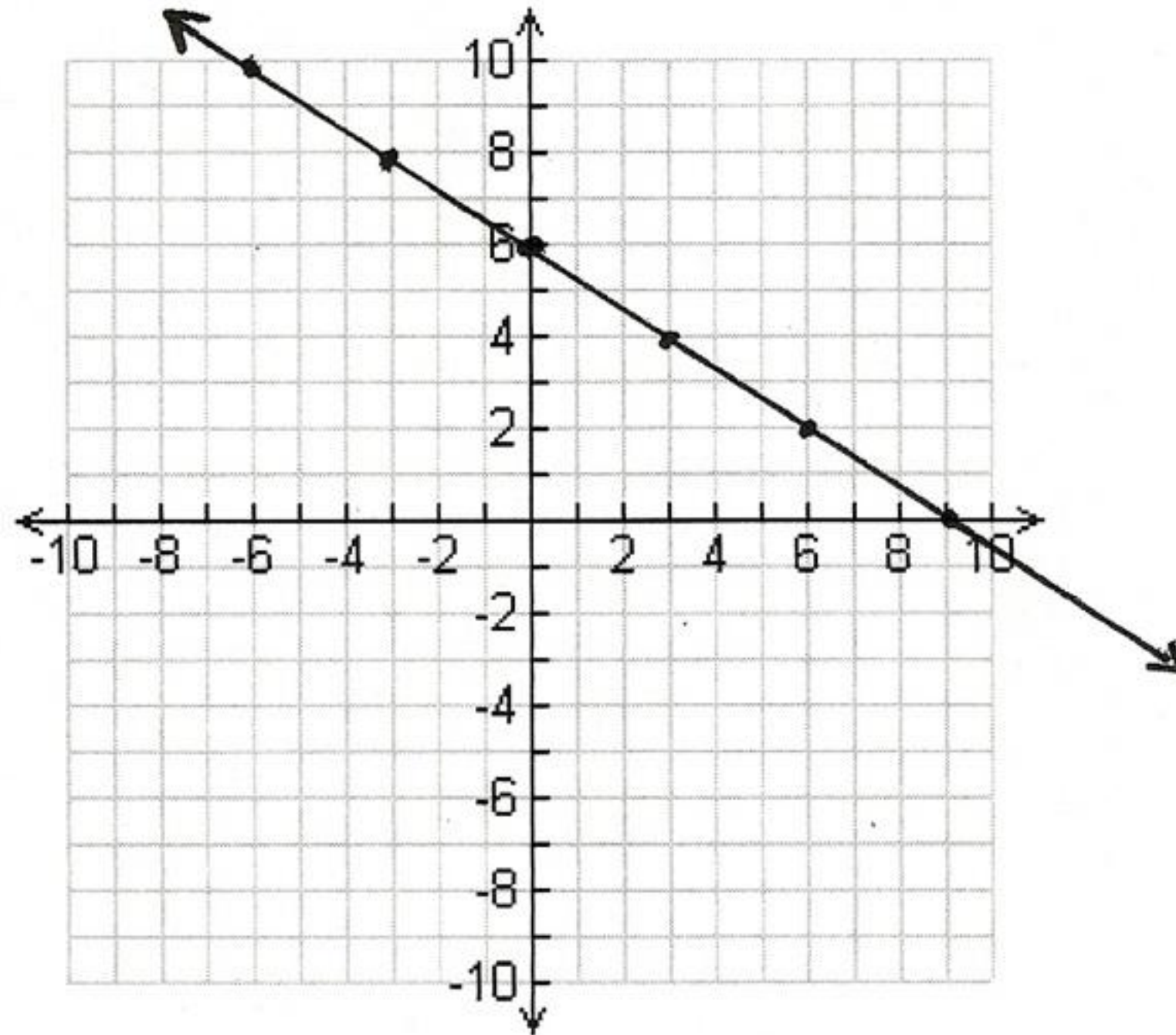
Phil: I kept plugging in the number for Y instead of X. That's why we came up with different numbers.



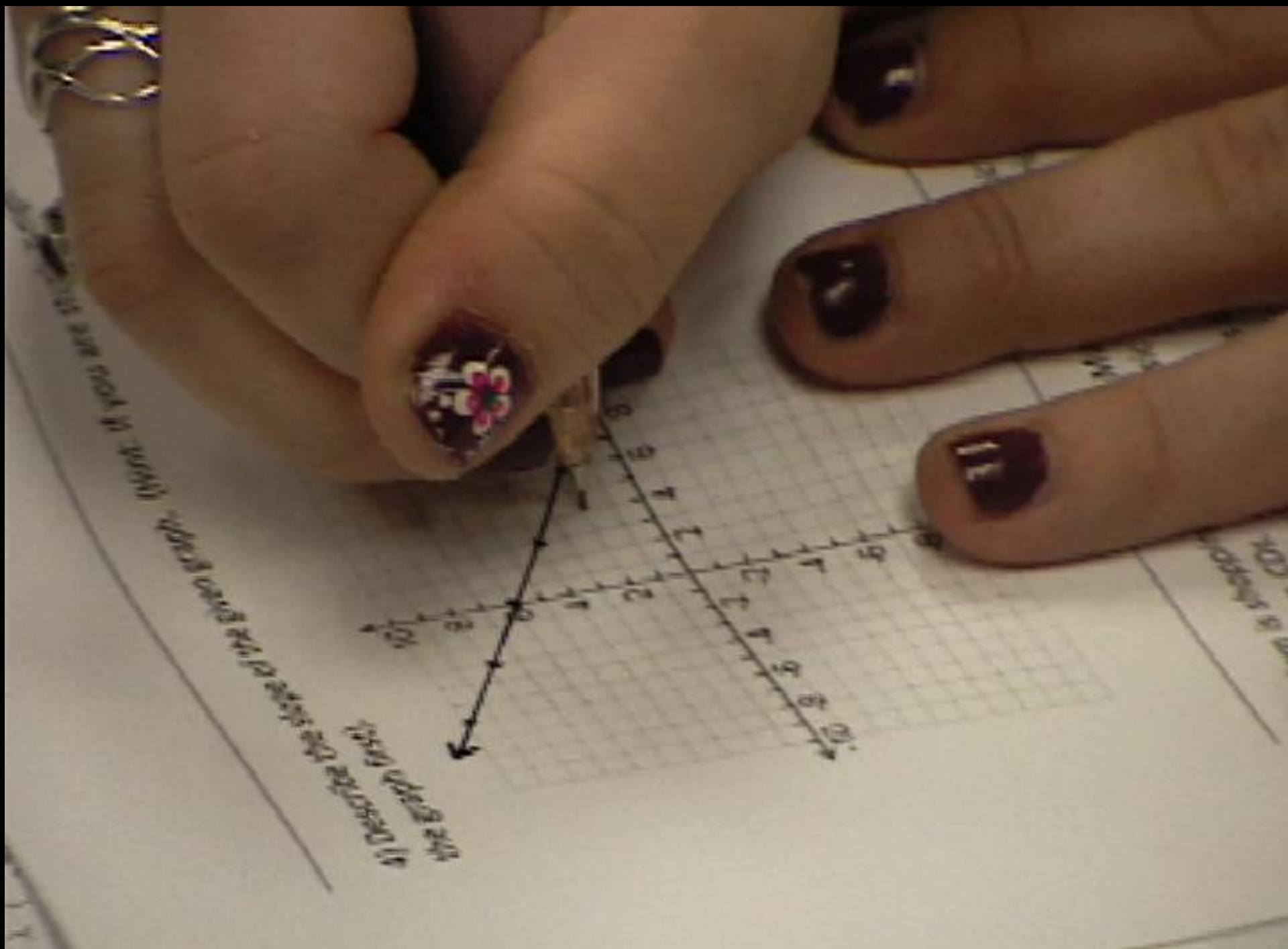
Nate: It can go both ways.
Mike: You have to be ambidextrous.



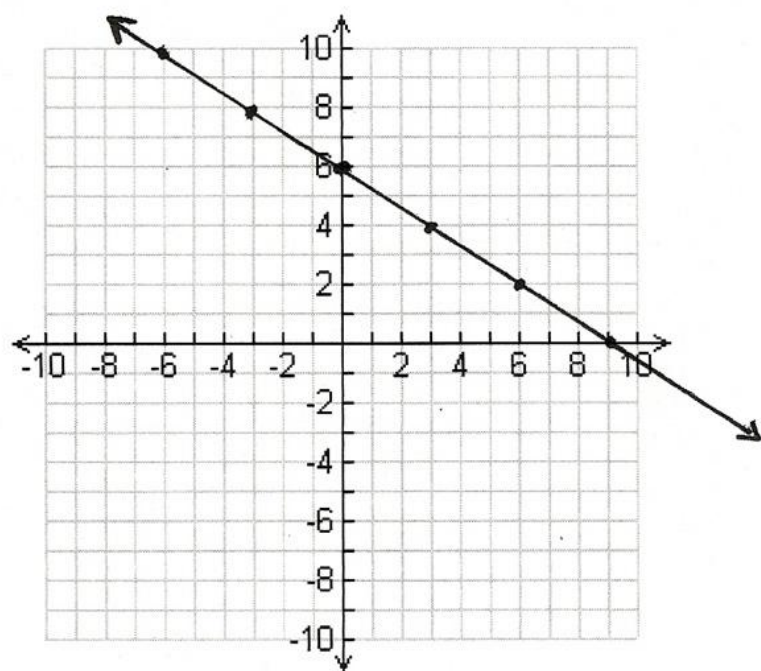
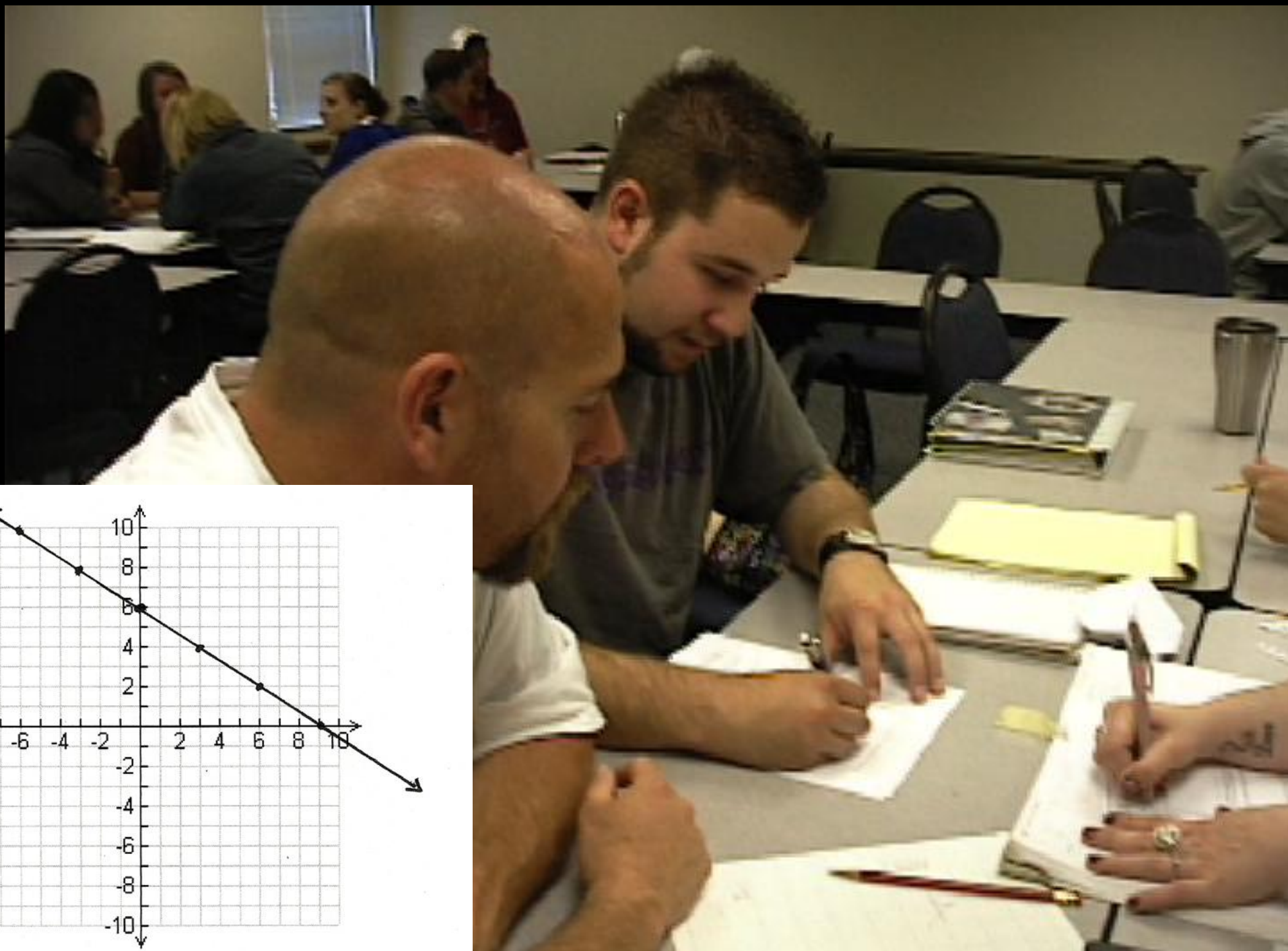
Megan reads the next problem:
“Describe the slope of the given graph.”



Megan: So, just do rise over run.



Beginning at $(3,0)$ she counts upward to the dot at $(3,4)$. One, two, three, four. Then starting at the dot at $(6,2)$, she counts left to $(3,2)$. Over one, two, three.

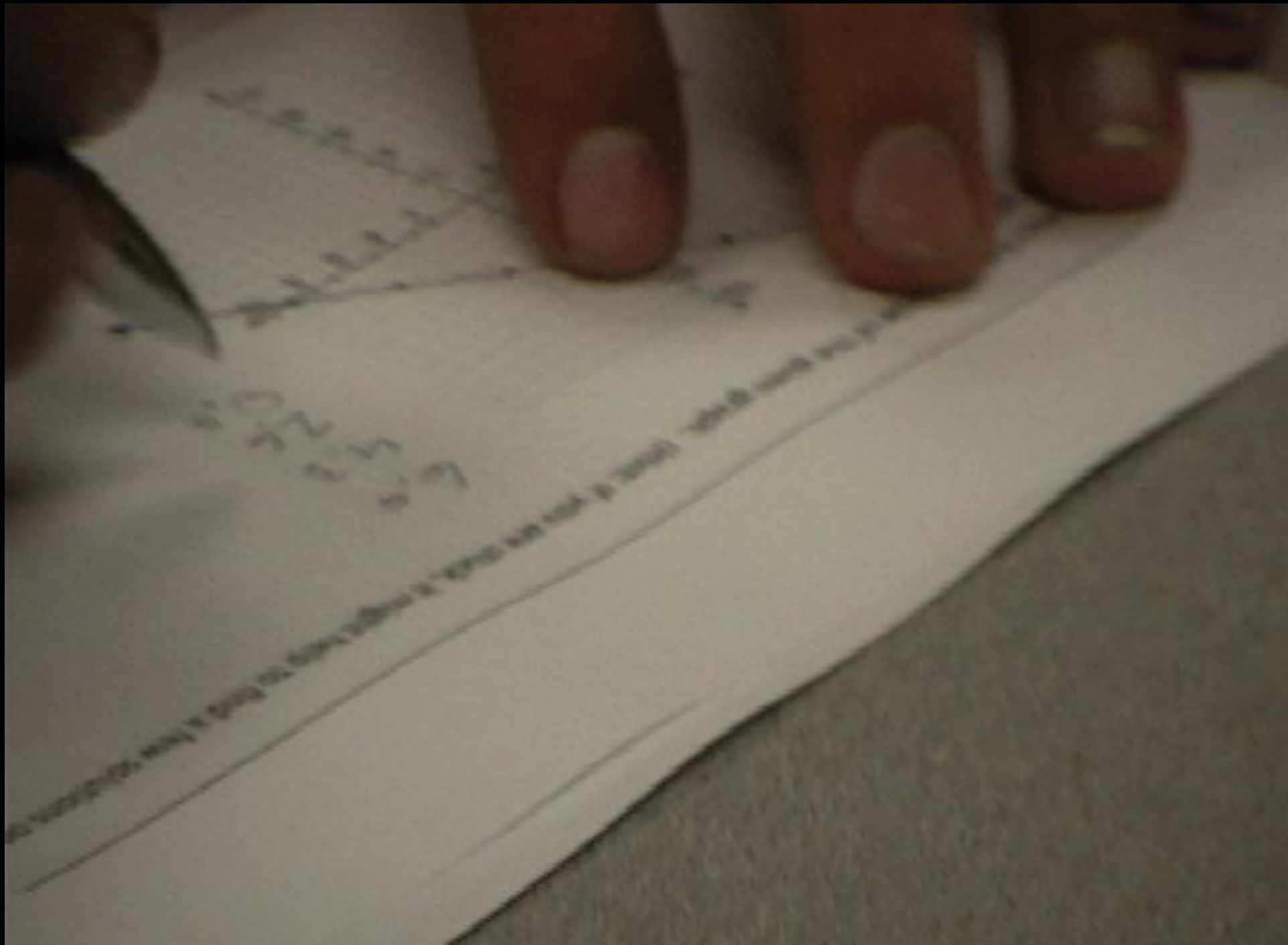


Nate lists the coordinates of the dots as (6,0) (4,3) (2,6) (0,9)

Mike: If they are in different quadrants it is going to be completely different answers.



Megan: No, it's not. It is still the same.



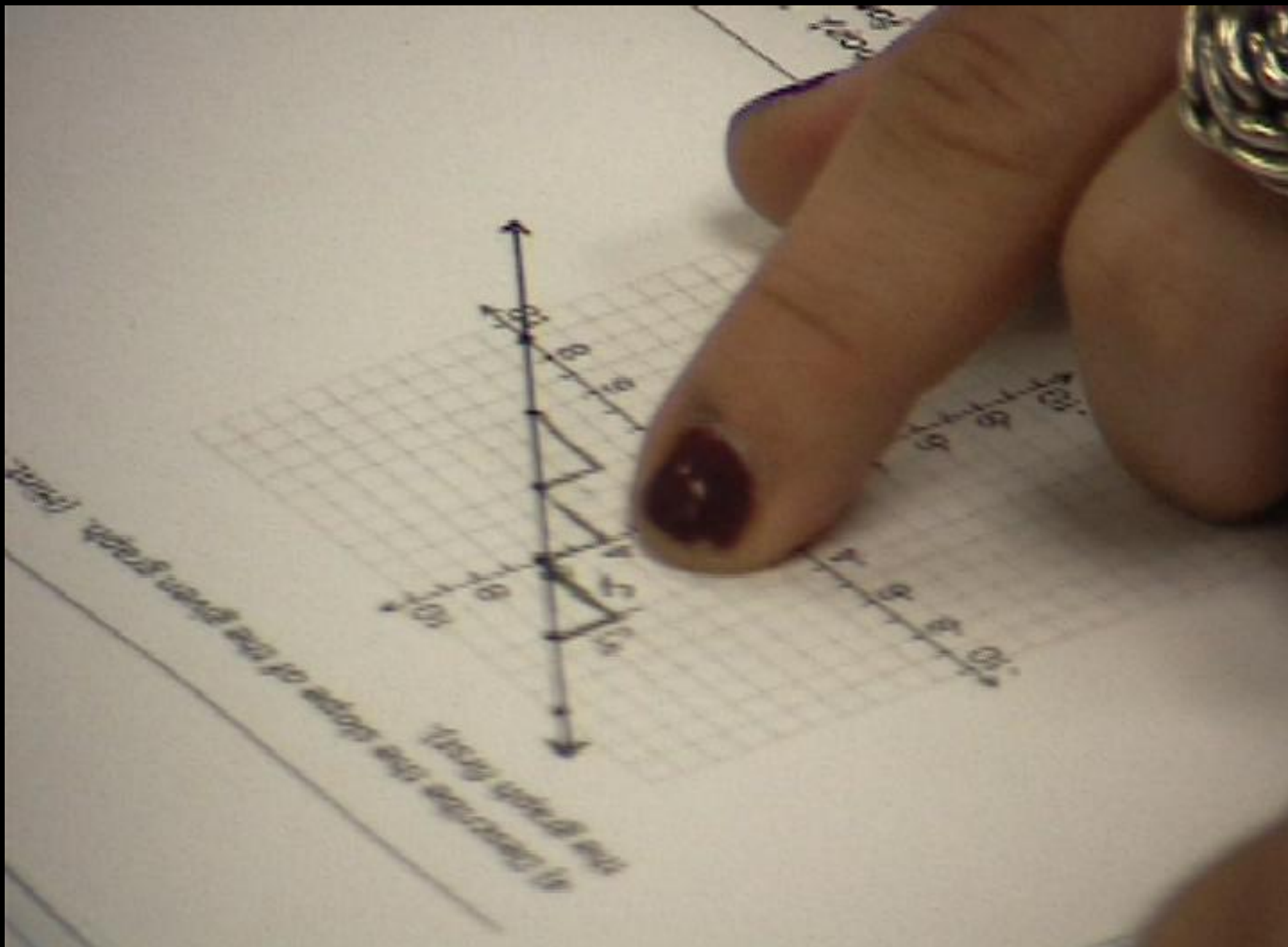
Nate: This is literally what is plotted there.



Allison: I get this, but I don't.



Megan: So you have plot points on a graph. Basically what you are going to do is connect them. You go down so many and over, so you can count them.

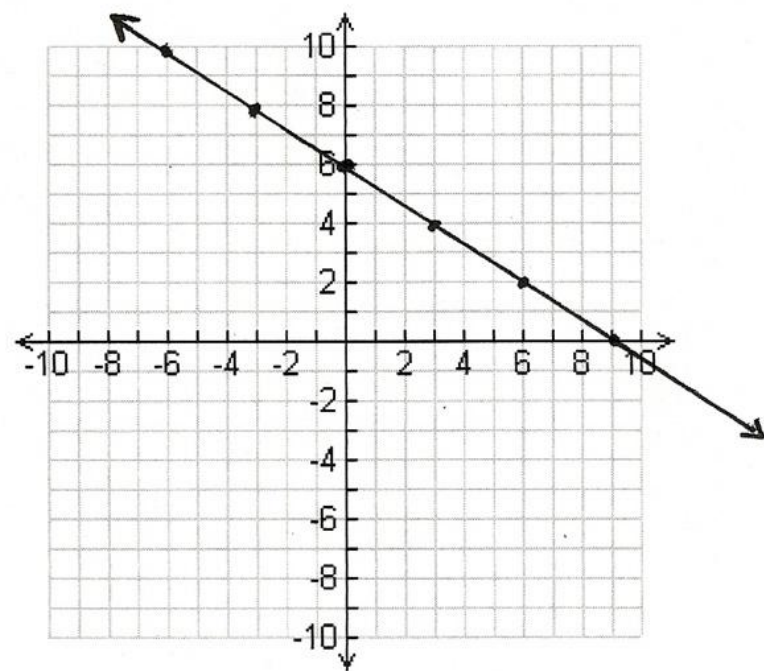
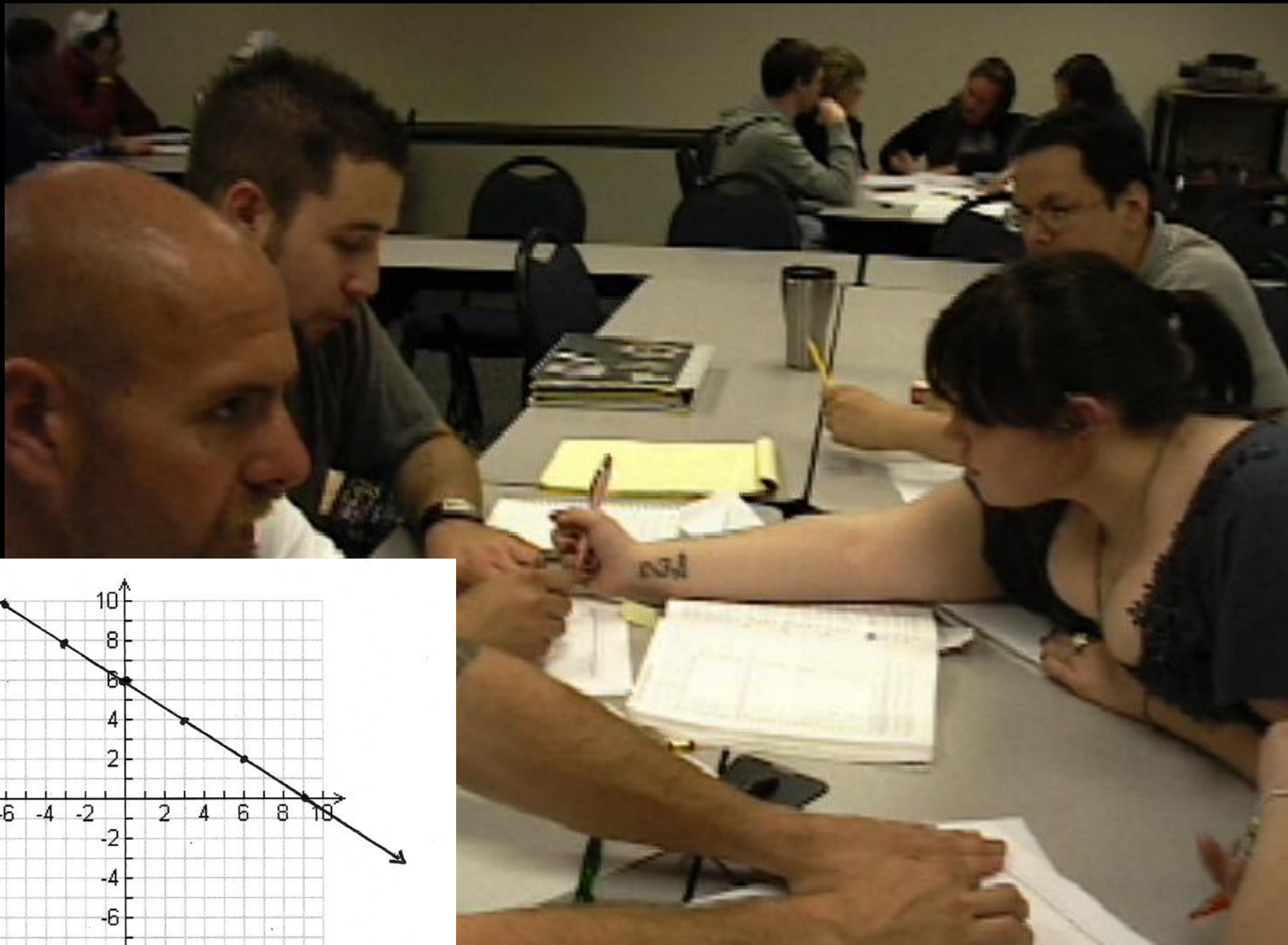


Alison: So it is like connecting the dots.

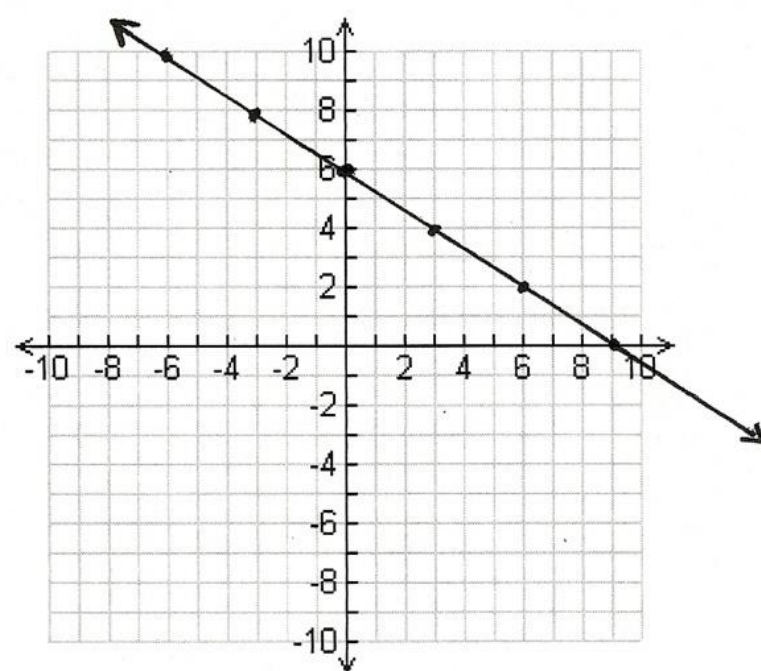
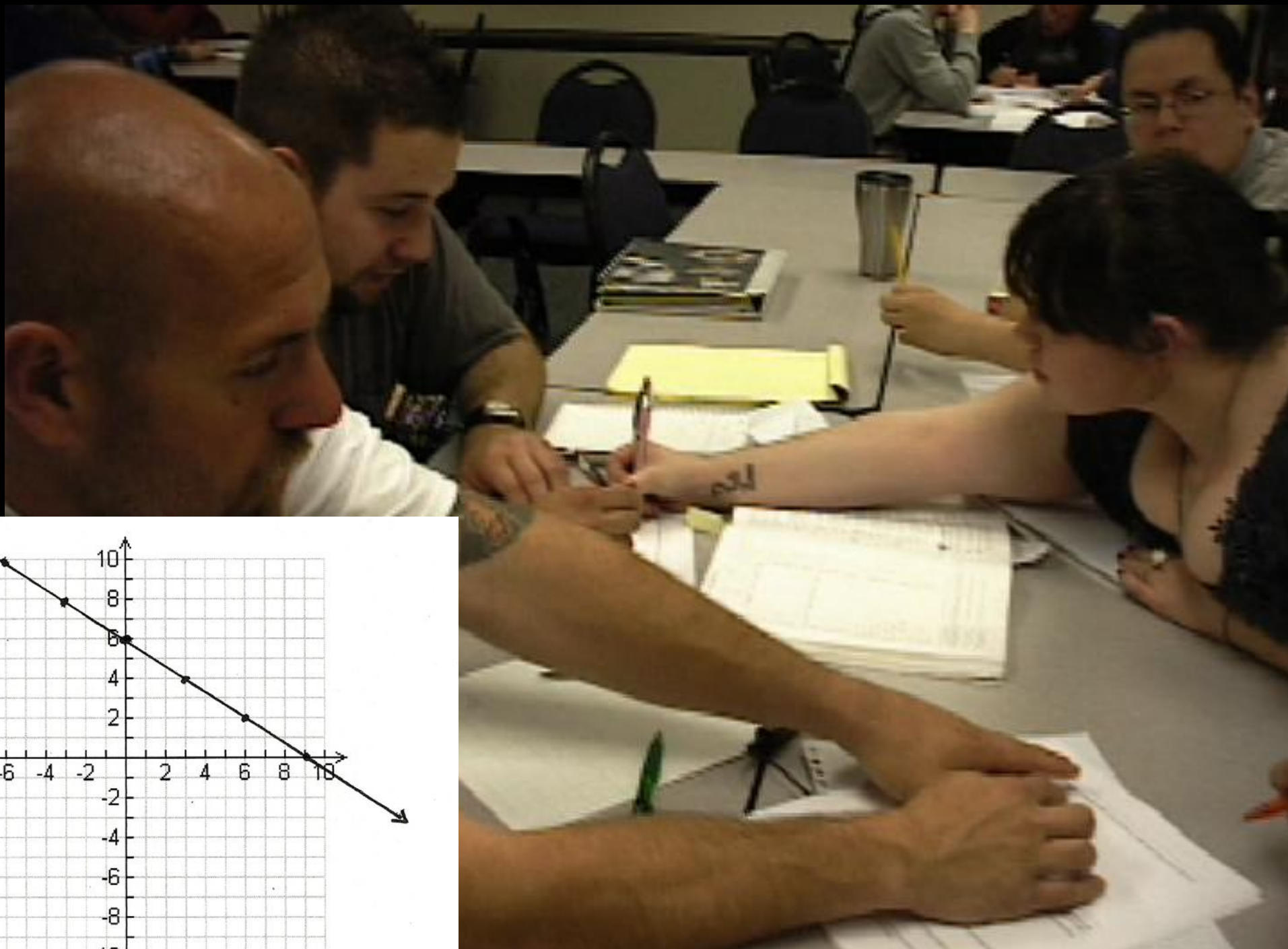
Megan: So your rise is 3 and your run is 4.



As Mike is describing how the upper right quadrant is like common graphs Alison is familiar with, Megan asks Nate: How did you get -2 ?



Nate: So here, your $x = 6$ and your $y = 0$, right?
In this case your $x = 4$ and your $y = 3$.

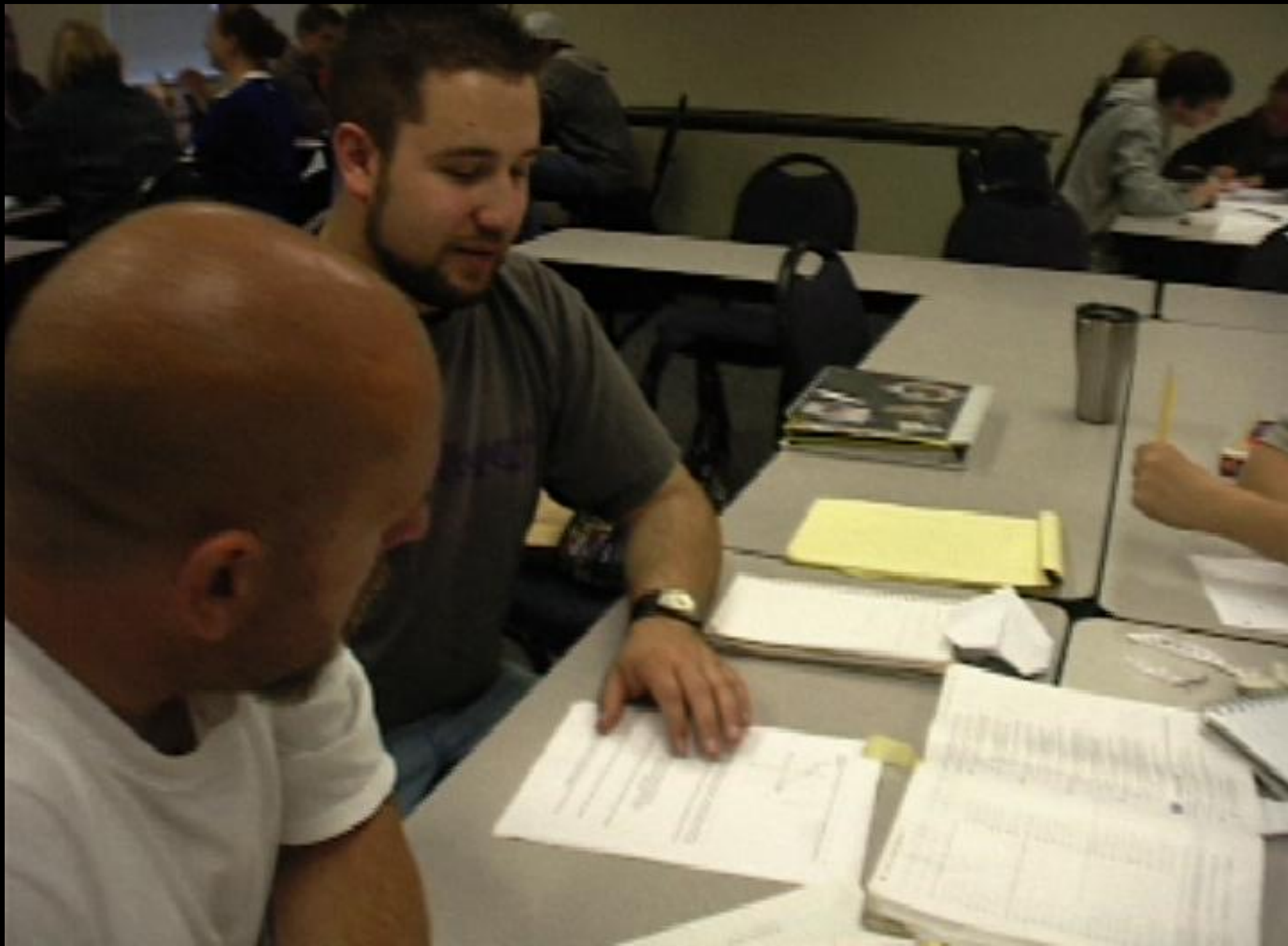


Megan: What we did was this.
She draws a horizontal line and vertical line from one plot point to the next.



Nate: Rise and run is a bit different than slope.

Megan: No. The slope is rise over run.

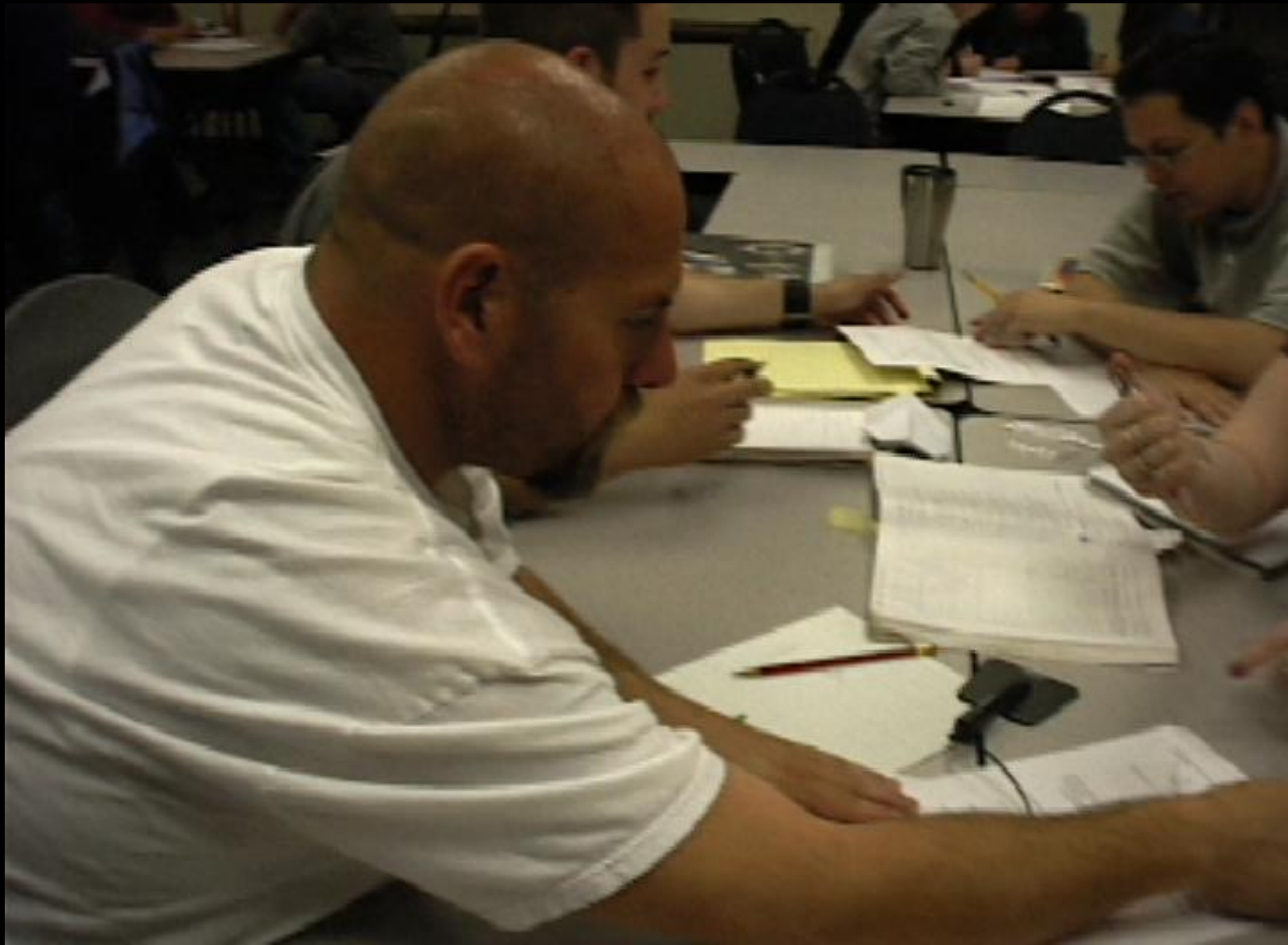


Nate: Your concept is right, but in this case there is no rise, because we are going down. Hence the negative. Do we all agree? Phil?



Nate: You get my methodology here?
You just plug in the points.

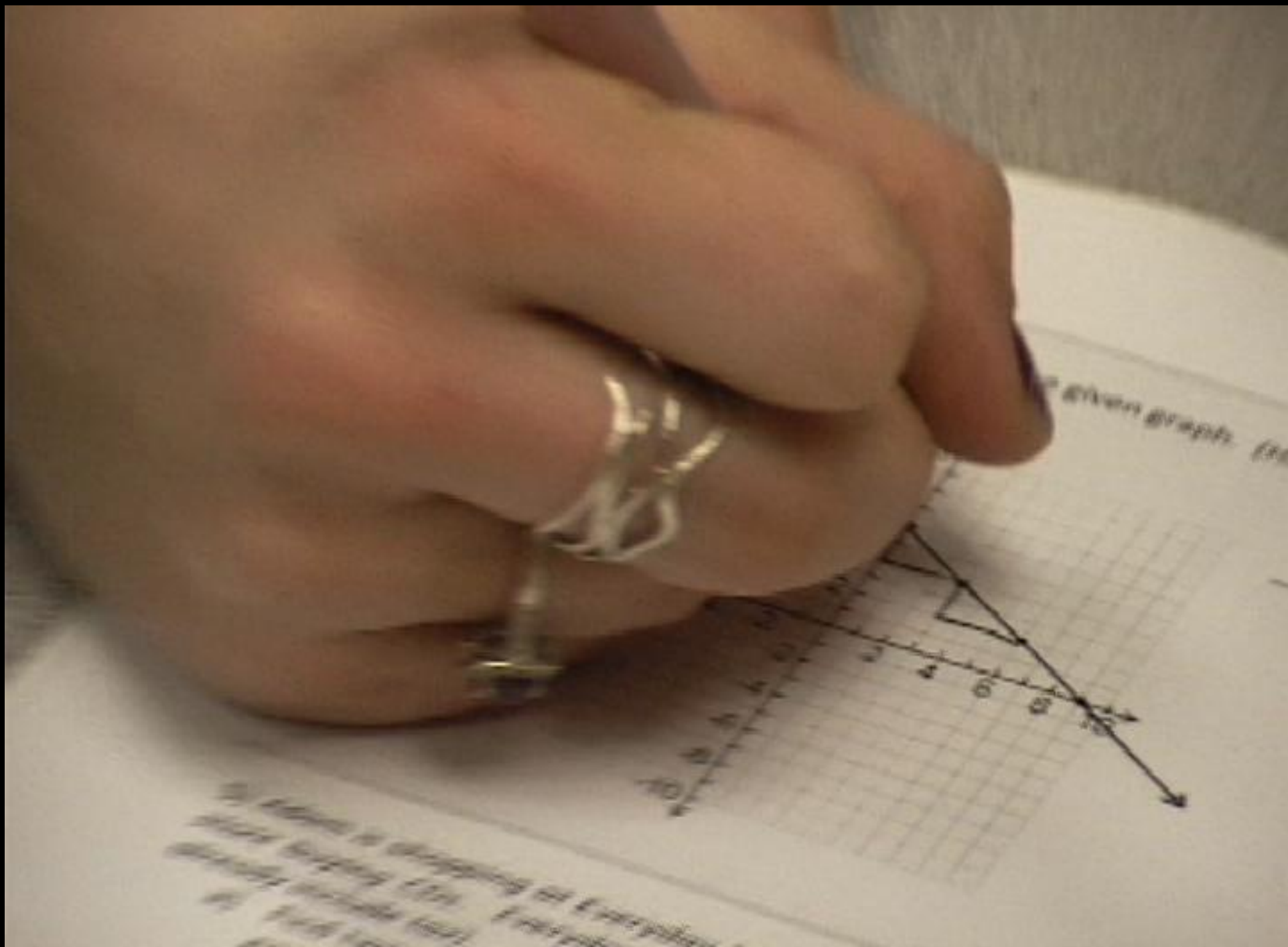
Phil: Yeah.



Mike: How did you figure the rise and run?



Megan: Since it is declining, the x is going to be negative. It is one, two, so it is negative 2.



Megan: And it is going to go over one, two, three, four. So I am going to know my slope is -2 to 4 .



Mike: So, it is a decline of two. *Megan:* So it makes a negative. *Mike:* It is still rise and run, but you are rising backwards.



Megan: So my rise is -2 and my run is 4 .



Alison reads the final problem: “Adam is shopping at Everyday Music (a used music shop). He would like to spend exactly \$104 at the store buying CDs.



Everyday music has just two prices for their used CDs, either \$8 or \$4 including tax.”



Megan: Are we going to do the little box?
Mike: We could, but we already have the equation.
($8x + 4y = 104$ given in part [b] of the problem)

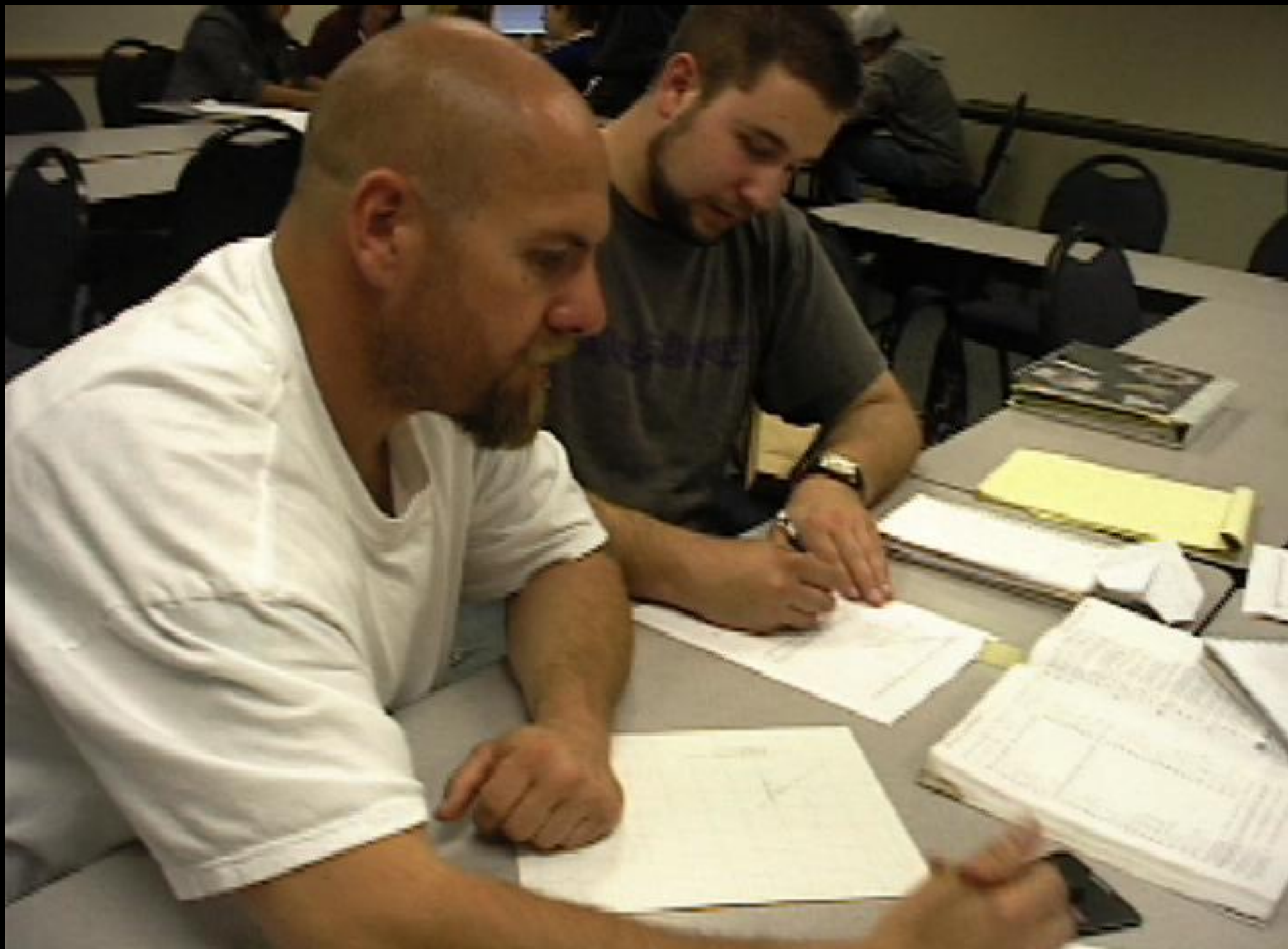


Alison reads part [a] of the problem:

“Find two possible solutions to Adam’s situation.”



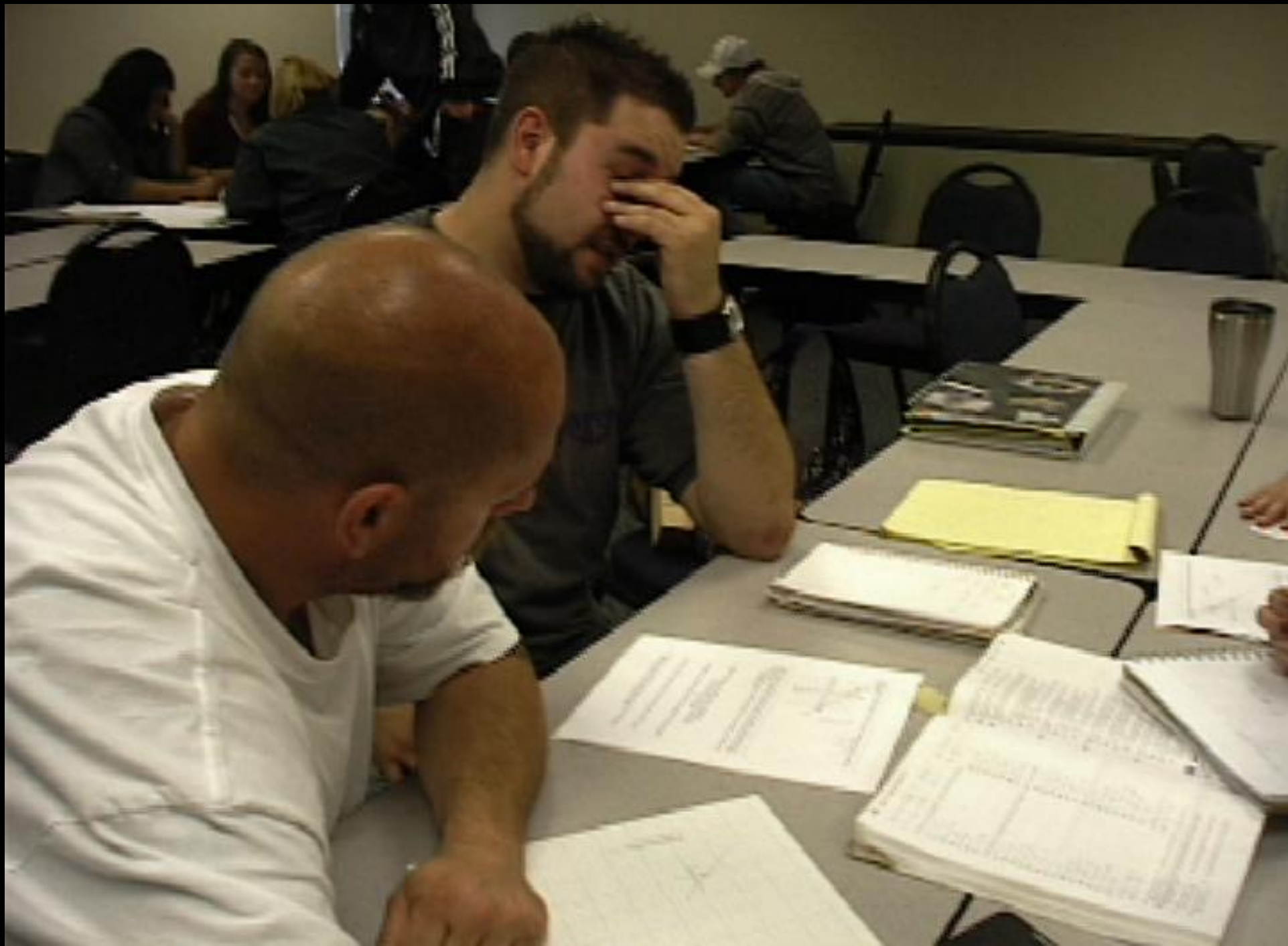
Long pause...
Megan: Oh, yay.
Mike: These are brutal.



Mike: He already gives the formula to us. Let x represent \$8, right?



Nate: We have the ratio here. It is 1 to 2. Or 2 to 1.
We have it described: x would be 2; y would be 1.
A 2:1 ratio.



Nate: So basically, he can buy twice as many CDs for 4 bucks... *pause...*



Mike: So divide 104 by 4. That will tell you how many he gets for \$4, right?



Phil: You divide 4 into 104 and you get 26.



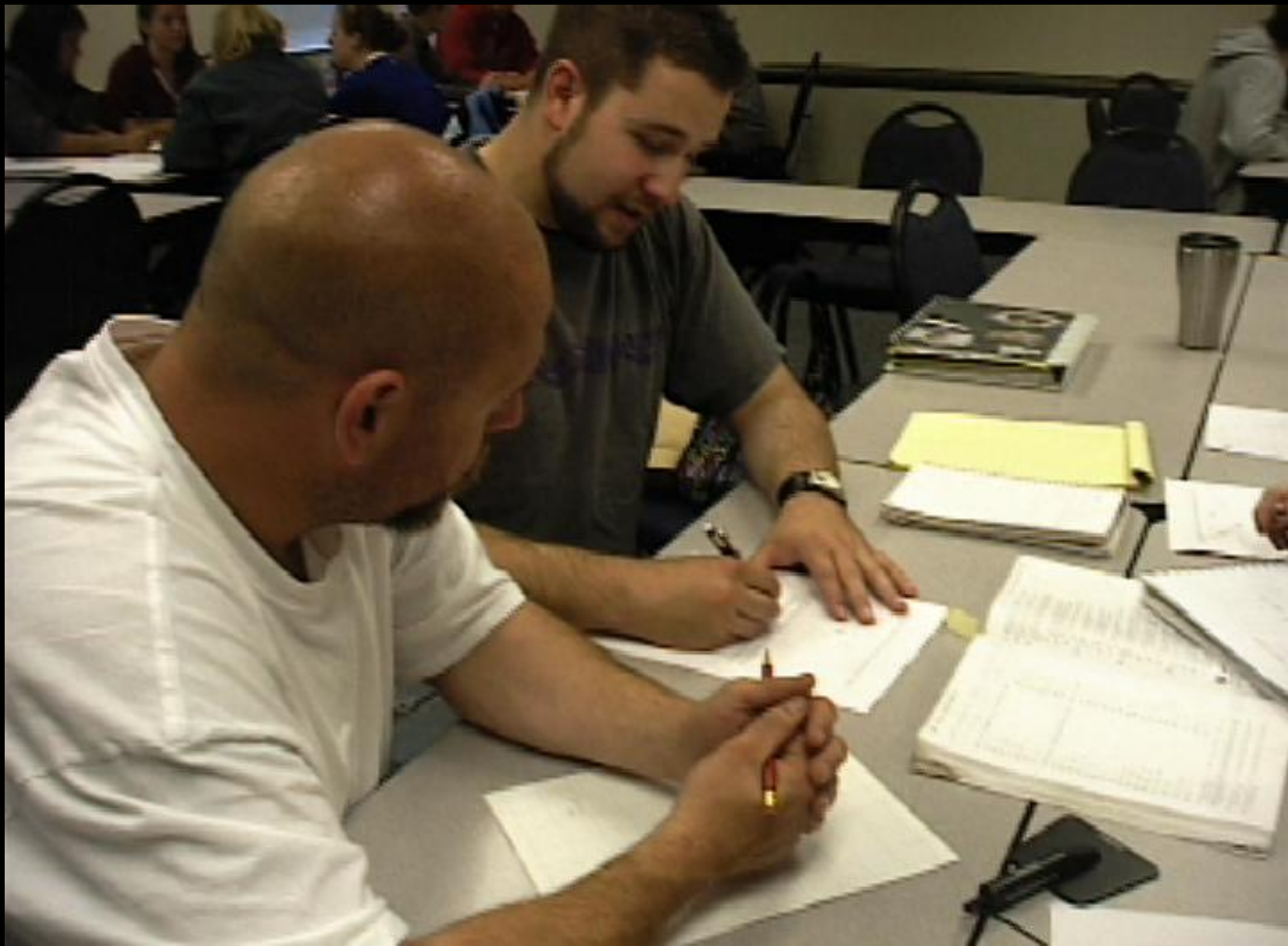
Nate: This is really easy.

Megan: You know what? This is may be easy for you, but it ain't easy for me. *Mike:* Easy is a relative term.



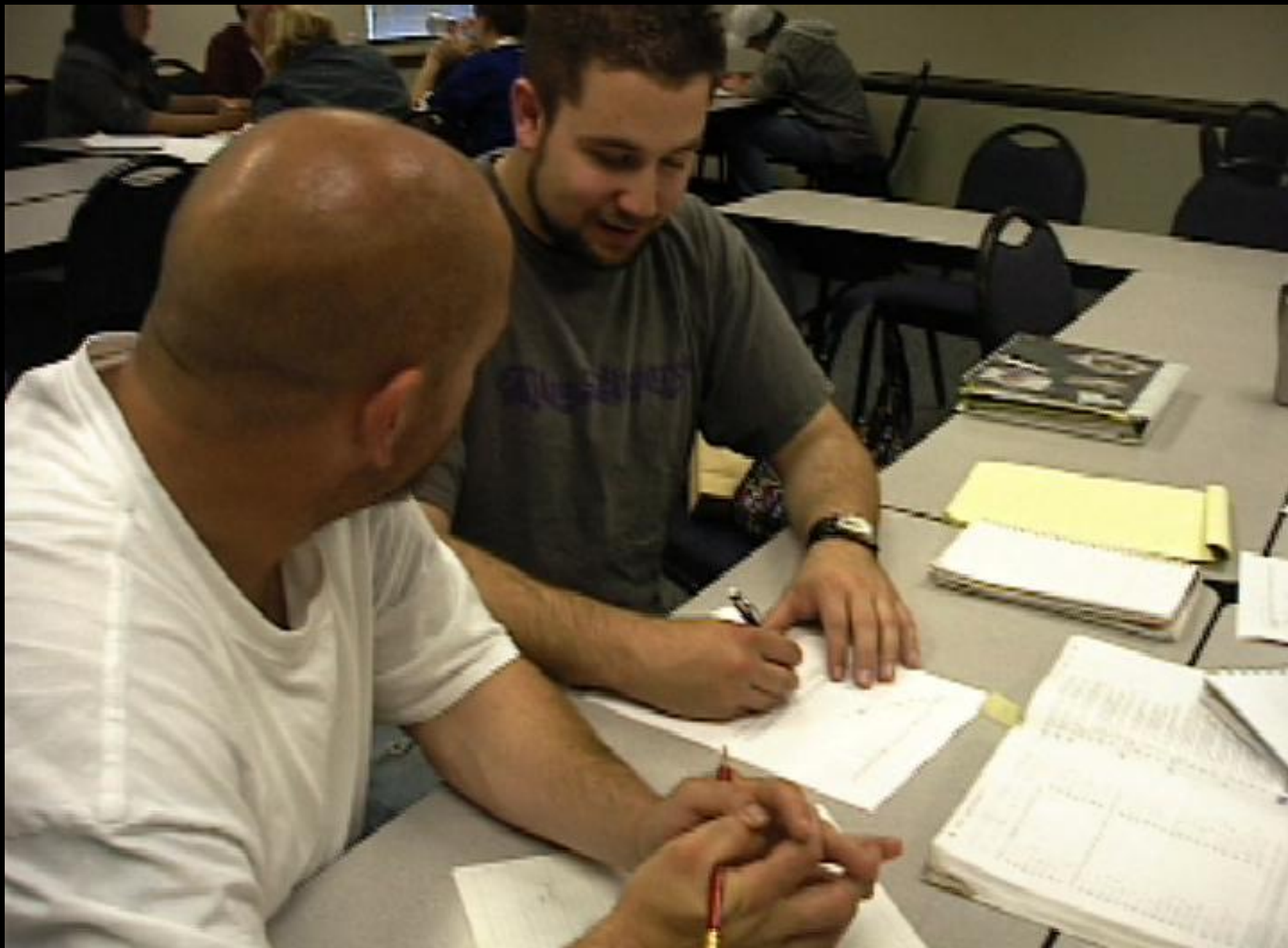
Mike Nevins, the instructor: Hey, no fighting.

Alison: We're not fighting. We're learning!



Nate: So he can buy 26 of the \$4 CDs?

Phil: Yes.

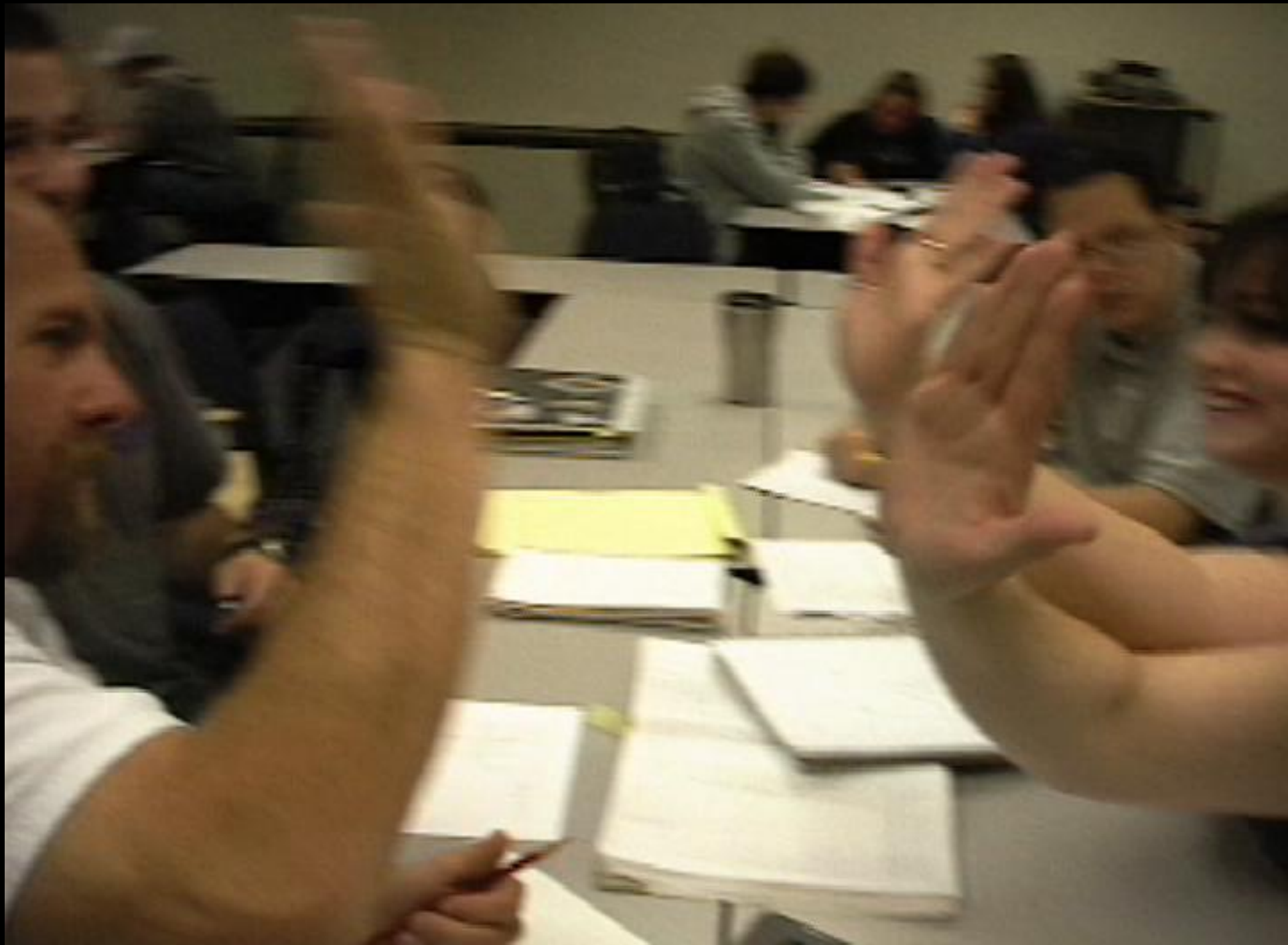


Nate: Or he could buy 13 \$8 CDs.



Megan: That's it?

Nate: That's it.



High Five!



Nate: In stereo!

Megan: That's what happens when you are in class for two semesters with each other.

Slope Fun

Mike, Nate, Phil, Megan and Alison

MATH 081 – Elementary Algebra I

Instructor: Mike Nevins

Everett Community College

Elapsed time: 23 minutes

Recorded and Transcribed by
Tom Drummond and Kalyn Owens
North Seattle Community College